DEPARTMENT OF THE AIR FORCE

SUPPORTING DATA FOR FISCAL YEAR 1984 BUDGET ESTIMATES

SUBMITTED TO CONGRESS JANUARY 31, 1983

A

DESCRIPTIVE SUMMARIES

RESEARCH, DEVELOPMENT, TEST AND EVALUATION

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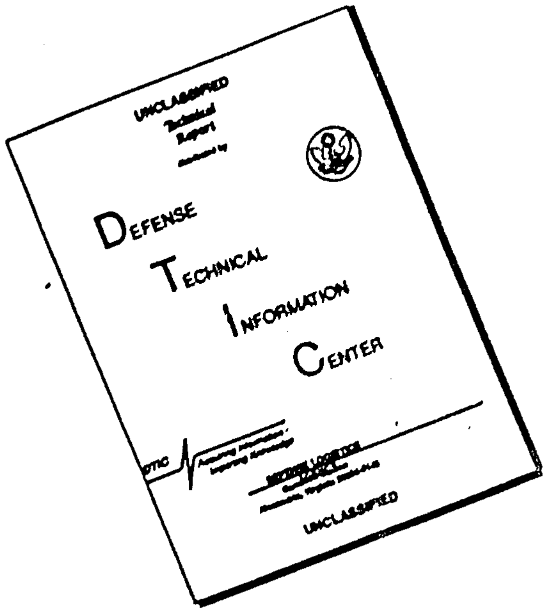

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DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF

THE DEPARTMENT OF THE AIR FORCE RESEARCH AND DEVELOPMENT PROGRAM

FY 1984

JANUARY 1983

A

INTRODUCTION AND EXPLANATION OF CONTENTS

1. (U) General. This document has been prepared to provide information on the United States Air Force (USAF) Research, Development, Test and Evaluation (RDT&E) Program to Congressional Committees during the Fiscal Year 1984 hearings. This information is in addition to the testimony given by DOD witnesses.

A Descriptive Summary is provided for each program element within the USAF FY 1984 RDT&E Program. A Test and Evaluation section is provided for major weapon systems. The formats and contents of this document are in accordance with the guidelines and requirements of the Congressional Committees insofar as possible.

The "RESOURCES" portion of the Descriptive Summaries includes, in addition to RDT&E funds, procurement funds and quantities, Military Construction Appropriation funds on specific development programs, Operation and Maintenance Appropriation funds where they are essential to the development effort described, and where appropriate, Department of Energy (DOE) costs.

The last section of the Fiscal Year 1984 Descriptive Summaries, entitled "Facilities Exhibits," contains information on major improvements to and construction of government owned facilities funded by RDT&E.

2. (U) Comparison of Fiscal Year 1982 and 1983 Data. A direct comparison of Fiscal Year 1982 and Fiscal Year 1983 data shown in this document with corresponding data in the Program Element Descriptive Summaries dated 8 February 1982 will reveal significant differences. Many of the differences are attributable to the following factors:

a. (U) Fiscal Year 1983 reductions as a result of Congressional action on the appropriation.

b. (U) Fiscal Year 1982 funding changes subsequent to October 1, 1981, due to RDT&E Reprogramming Actions.

c. (U) Reclassification of Fiscal Year 1982 and Fiscal Year 1983 data to achieve comparability with the program structure for Fiscal Year 1984.

3. (U) Relationship of Fiscal Year 1984 Budget Structure to the Fiscal Year 1983 Budget Approved by Congress.

PROGRAM ELEMENT	REMARKS
BUDGET ACTIVITY 2: ADVANCED TECHNOLOGY DEVELOPMENT	
63106F Logistics Research & Development Requirements	New program proposed for FY 1984
63704F Manpower Personnel Systems Technology	New program proposed for FY 1984
BUDGET ACTIVITY 3: STRATEGIC PROGRAMS	
12436F Command Center Processor/Display System	New program proposed for FY 1984
32015F National Emergency Airborne Command Post	New program element for effort previously included in program element 11312F
35155F Theater Nuclear Weapon Storage & Security System	New program proposed for FY 1984
63716F Atmospheric Surveillance Technology	New program proposed for FY 1984
64326F Strategic Conventional Standoff Capability	New program element for Project 2787, Conventional Standoff Capability, previously included in program element 11113F
BUDGET ACTIVITY 4: TACTICAL PROGRAMS	
27132F Derivative Fighter	New program element for projects previously included in program elements 27130F and 27133F
27595F Base Communications - Tactical Air Forces	New program proposed for FY 1984
41840F Military Airlift Command Command/Control System	New program proposed for FY 1984
63256F Joint Service Advanced Vertical Lift Aircraft	New program element for effort previously included in program element 64735F

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PROGRAM ELEMENT	REMARKS
63307F Air Base Survivability & Recovery	New program element for Project 2895, Air Base Survivability previously included in program element 64708F
63749F Command, Control, and Communications Counter Measures Advanced Systems	New program proposed for FY 1984
63770F Joint STARS Advanced Development	New program element for effort previously included in program element 63747F, PAVE MOVER
64325F Standoff Attack Weapon	New program proposed for FY 1984
64617F Air Base Survivability	New program element for Project 2895, Air Base Survivability previously included in program element 64708F
64703F Aeromedical Systems Development	New program proposed for FY 1984
64770F Joint Surveillance and Target Attack Radar System (Joint STARS)	New program element for effort previously included in program element 64616F, PAVE MOVER Engagement System
BUDGET ACTIVITY 5: INTELLIGENCE & COMMUNICATIONS	
35164F NAVSTAR Global Positioning System (User Equipment)	New program element for effort continuing development of User Equipment to support program element 64778F
84733F General Intelligence Skill Training	New program proposed for FY 1984
BUDGET ACTIVITY 6: DEFENSE-WIDE MISSION SUPPORT	
64609F Logistics Technology for Weapons Systems	New program proposed for FY 1984
71112F Inventory Control Point Operations	New program proposed for FY 1984

4. (C) Classification.

a. (U) Classified pages bear the appropriate security classification. Classified data is identified by use of brackets [ ].

b. (C) [ ]

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TECHNOLOGY BASE

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ADVANCED TECHNOLOGY DEVELOPMENT

STRATEGIC PROGRAMS

STRATEGIC PROGRAMS

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STRATEGIC PROGRAMS

TACTICAL PROGRAMS

TACTICAL PROGRAMS

TACTICAL PROGRAMS

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TACTICAL PROGRAMS

INTELLIGENCE AND COMMUNICATIONS

INTELLIGENCE AND COMMUNICATIONS

DEFENSE-WIDE MISSION SUPPORT

DEFENSE-WIDE MISSION SUPPORT

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DEFENSE-WIDE MISSION SUPPORT

DESCRIPTIVE SUMMARIES

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FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #61101F
DOD Mission Area: #510 - Defense Research

Title: In-House Laboratory Independent Research
Budget Activity: #1 - Technology Base

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	11, 258	12,624	13,069	17,005	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This effort is spread among thirteen research and development laboratories and provides discretionary funds to the Laboratory Directors to pursue new work of high promise or importance. The program is personally reviewed annually by the Assistant Secretary for Research, Development and Logistics. No higher headquarters approval or justification is required prior to starting the work, which is usually a one-time effort to initiate activities on time-critical ideas.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	11,258	13,124	15,580		Continuing	N/A

The reduction in FY 1983 funding is a result of Congressional action.

4. (U) OTHER APPROPRIATION FUNDS: Not applicable.

Program Element: #61101F
DOD Mission Area: #510 - Defense Research

Title: In-House Laboratory Independent Research
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5. (U) RELATED ACTIVITIES: Efforts accomplished through this program are important and an integral part of the total work being done in the Air Force Laboratories. Usually funds are used to start or expand particularly promising work and continue for one year or until the work is transitioned to the regular program. The responsibility for insuring against unwarranted duplication of efforts rests with the Laboratory Directors. Similar programs are funded by the Army and Navy.

6. (U) WORK PERFORMED BY: Numerous small and moderate size contracts are placed with universities and industry each year, in conjunction with directly related in-house laboratory efforts, to investigate promising new areas of Research and Exploratory Development. Directors of the Air Force in-house laboratories are supported by and participate in this program. The five major contractors were: Systems Research Laboratories, Inc., Dayton OH; Pratt and Whitney Aircraft Group, West Palm Beach FL; Advanced Information & Decision Systems, Mountain View CA; Utah State University, Logan UT; Scientific Technology Associates, Inc., Princeton NJ. There are 105 additional contractors doing work under 134 contracts.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. The purpose of this program is to provide discretionary authority to Laboratory Directors of the Air Force Systems Command for new research work judged to be of high promise or importance. The Air Force has set up and administered this program in strict compliance with the intent that it would be unencumbered by restrictive reviews and procedures or justifications and documentation prior to beginning work. Laboratory Directors meet annually with the Assistant Secretary of the Air Force for Research, Development and Logistics to account for their research projects. The FY 1982 accomplishments are:

(1) (U) Radio Frequency Optic Link: Determine the feasibility and attainable characteristics of a simplex one kilometer long fiber optic link which has a passband of 4.4-5.0 gigahertz. Some measured link characteristics were: Signal/Noise ratio of 48 decibels over a 300 kilohertz bandwidth; gain flatness across the full megahertz band of $\pm$ 1.5 decibels at a modulation depth of 65 percent. This link is unique in that it establishes that direct modulation of optical sources by a radio frequency signal is achievable to 6 gigahertz. This link sets the state of the art for radio frequency carrier transmission via fiber optics and allows for layer separation of antennas and the radio frequency sources for increased survivability of the tactical command, control and communication assets.

(2) (U) Macro-Modeling Approach to Digital Integrated Circuits: Applied the theoretical foundations established for macro-modeling analog integrated circuits to digital integrated circuits. Macro-models for simple digital circuits were developed which predict the ideal performance with significantly less than the number of elements in the component itself. A probablistic approach to digital integrated circuits was developed which accounts for the randomness associated with the component performance characteristics and device response. Provided guidelines and concepts required to develop models of complex digital electronic circuits for electromagnetic compatability/interference analysis.

Program Element: #61101F | Title: In-House Laboratory Independent Research
DOD Mission Area: #510 - Defense Research | Budget Activity: #1 - Technology Base

(3) (U) Adaptive Radar Target Classification: Demonstrated the feasibility of tactical target recognition using high resolution synthetic aperture radar. This development is being incorporated into the Automatic Synthetic Aperture Radar Target Classification System, which addresses total automation of the recognition process for tactical strike application; and the Fine Resolution Synthetic Aperture Radar Machine Augmented Image Analysis, which addresses the machine assisted interpretation problem for tactical reconnaisance application.

(4) (U) Molecular Flare Study: A new flare concept was evaluated in a rudimentary field setup configuration and basic feasibility was demonstrated. This flare concept was shown to be spectral emmission tailorable and has a higher efficiency potential than present approaches.

(5) (U) Inflight Doppler Bubble Sensor for Warning of Bends Risks: Developed a device to detect intravascular precardial bubbles which can be used in an inflight system to warn high altitude aircraft pilots of impending bends. This device has been provided to the Strategic Air Command for use by U-2 and SR-71 support personnel.

(6) (U) Development of a Rapid Analysis Method of Turbine Engine Oil: Developed a rapid colorimetric method for analyzing turbine engine oil for titanium. Present instruments only provide for analysis for iron which is considered to be the primary wear metal for oil analysis. A significant percentage of newer engines, however, exhibit titanium wear metal in their oil. The system developed under this effort provides for go-no-go decisions in deployment situations where normal spectrometric oil analysis equipment in not available. The analysis can be accomplished in sixteen minutes and it details both iron and titanium which are two major wear metals in the lubricating system of the primary deployable aircraft used by the Tactical Air Command and United States Air Force in Europe.

(7) (U) Liquid Droplet Radiation for Space Applications: Completed the evaluation of this innovative idea for a heat rejection system for space that is far lighter and less vulnerable to single point failure than the conventional radiators currently in use. The concept has potential for both nuclear and non nuclear space power system applications. Moreover, it appears that near term applications of the concept is possible for heat rejection use in a space cryogenic storage system.

(8) (U) Silicon Carbide Reinforced Aluminum Structure: Demonstrated that the superplastic formability of silicon carbide reinforced 7475 aluminum is sufficient to form structural parts. The material formed contains approximately 15 volume percent silicon carbide and is 27 percent stiffer than conventional aluminum. A study applying this material to the B1-B environmental control system door showed 33 percent acquisition cost savings in one concept and 51 percent weight savings in another.

(9) (U) Advanced 3D Materials: Demonstrated the feasibility of using advanced 3D automated weaving technique to generate advanced heatshield material. A convective heating computer code was used to calculate the heat transfer distribution and thickness requirements for measuring reentry vehicle heatshield. Preforms were designed and fabricated with varying windward and leeward wall thickness. An external but integral carbon composite layer was produced by using radiant pyrolysis during during processing. This radiant approach permits a gradual change in matrix resin content with depth thereby yielding a more ablation resistant outer surface and an insulative inner surface.

Program Element: #61101F

DOD Mission Area: #510 - Defense Research

Title: In-House Laboratory Independent Research

Budget Activity: #1 - Technology Base

(10) (U) Troubleshooting Procedures Based on Sneak Circuit analysis: Developed procedures for using sneak circuit analysis products as a basis for fault isolation procedures for two malfunctions of the F-16 flight control system. The test results indicated that the sneak circuit data base and procedures developed provide an effective basis for development of fault isolation trees.

(11) (U) Liquid Metal Arc Heater Production of Titanium: Demonstrated the feasibility of a plasma process using the sodium reduction of titanium tetrachloride to produce pure titanium metal and its alloys. This process is highly promising and has the potential ability to replace conventional batch technology by a one-step, continuous process with the prospect of a higher purity product.

The distribution of $12.624 million for FY 1983 was approved by the Assistant Secretary of the Air Force for Research, Development and Logistics. The Laboratory Directors will again select projects of high promise to be supported. The program in FY 1984 will continue as in FY 1983.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #61102F
DOD Mission Area: #510 Defense Research

Title: Defense Research Sciences
Budget Activity: #1 Technology Base

1. (U) *RESOURCES (PROJECT LISTING): ($ in Thousands)*

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	136,179	155,000	180,888	198,021	Continuing	Not Applicable
2301	Physics	14,678	14,578	18,838	19,237		
2303	Chemistry	13,798	16,853	18,623	18,958		
2304	Mathematics	12,660	14,709	18,003	20,327		
2305	Electronics	16,163	14,996	22,136	22,534		
2306	Materials	18,085	19,148	21,423	21,808		
2307	Mechanics	20,521	21,141	23,804	24,232		
2308	Energy Conversion	9,316	11,564	12,878	19,110		
2309	Terrestrial Sciences	2,429	2,563	2,758	2,807		
2310	Atmospheric Sciences	8,900	9,669	10,358	10,544		
2311	Astronomy and Astrophysics	5,276	5,473	5,859	8,964		
2312	Biological and Medical Sciences	8,104	8,518	9,504	12,675		
2313	Human Resources	6,249	5,788	6,704	6,825		
2917	University Research Instrumentation	-0-	10,000	10,000	10,000	20,000	50,000

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element supports the entire Air Force research effort and includes the in-house and extramural activities in industry and universities. It is managed by the Air Force Office of Scientific Research (AFOSR), the organizational element of Air Force Systems Command charged to plan, implement and control the Air Force Defense Research Sciences program. Typically, about 20% of the funds are expended to support in-house research in the technology laboratories, about 25% supports research in industry, and about 55% of the funds support research in universities. The principal thrusts of the research program are in the areas of aerospace structures and aerodynamics; materials; propulsion and power; electronics; directed energy; conventional weapons; terrestrial, atmospheric, and space sciences; and life sciences. Increased funding for FY 1984 will be used for several new major initiatives, some growth in FY 1982 and FY 1983 initiatives, and a modest growth in the continuing program. Major FY 1984 initiatives will be: (1) Short Wavelength Laser Sources ($4.0 million, Project 2301), (2) Reliability of Real Systems ($2.0 million, Project 2304), and (3) Optical Signal Processing ($5.0 million, Project 2305). The momentum of FY 1983 space-directed initiatives in space propulsion and power, spacecraft structures and materials, spacecraft image processing, and spacecraft survivability will be increased in FY 1984 by a growth of $5.0 million. The momentum of FY 1982 initiatives in aerodynamics of fuel efficient aircraft and low speed take off and landing, weapon system automation, manufacturing sciences, and chemical defense will also be increased by a growth of $4.0 million. Finally, a new project (2917) which began in FY 1983 to upgrade and modernize research equipment in the university community will be continued in FY 1984 ($10.0 million). All programs are directed toward the improvement of Air Force technology, the initiatives providing funds for near term objectives and the continuing technical program providing for long term objectives.

Program Element: #61102F
DOD Mission Area: #510 Defense Research

Title: Defense Research Sciences
Budget Activity: #1 Technology Base

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

	FY 1982 Estimate	FY 1983 Estimate	FY 1984 Estimate	1985 Estimate	Additional to Completion	Total Estimated Cost
TOTAL FOR PROGRAM ELEMENT	135,999	165,858	178,048		Continuing	Not Applicable

The FY 1983 reduction, from $165.9 million to $155.0 million, along with the requirement to fully fund the FY 1983 OSD University Research Instrumentation Program to upgrade and modernize research equipment in the university community at a $10.0 million level of investment, has resulted in delaying new starts in the FY 1983 space-directed initiatives, reducing the planned second year funding for the FY 1982 initiatives, and scaling back the planned continuing program.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

5. (U) RELATED ACTIVITIES: Program coordination among government agencies is achieved through annual interagency meetings and data exchange with the Army, Navy, National Science Foundation, Department of Energy, National Aeronautics and Space Administration, Federal Aviation Administration, Defense Advanced Research Projects Agency, Defense Nuclear Agency, and other Federal research activities. Other means of coordination include annual briefings to the Under Secretary of Defense for Research and Engineering, attendance at technical symposia and topical reviews covering research areas of common interest, and other activities such as the Joint Army-Navy-National Aeronautics and Space Administration-Air Force Propulsion Committee. In addition, particularly effective coordination is accomplished on an informal basis among individual Air Force program managers and their counterparts in other agencies or with scientists whose research is supported by other government sources.

6. (U) WORK PERFORMED BY: The Air Force basic research program is conducted predominantly under extramural grants and contracts with academic institutions and industry. The entire Air Force research program, extramural and in-house, is managed by the Air Force Office of Scientific Research, Bolling AFB, DC. Research is now underway in-house at the Air Force Wright Aeronautical Laboratories, Wright-Patterson AFB, OH; Air Force Armament Laboratory, Eglin AFB, FL; Air Force Weapons Laboratory, Kirtland AFB, NM; Air Force Rocket Propulsion Laboratory, Edwards AFB, CA; Air Force Geophysics Laboratory, Hanscom AFB, MA; Air Force Human Resources Laboratory, Brooks AFB, TX; Aerospace Medical Division, Brooks AFB, TX; Frank J. Seiler Research Laboratory, USAF Academy, CO; and the Rome Air Development Center, Griffiss AFB, NY. The ten major contractors are: Stanford University, Stanford, CA; Massachusetts Institute of Technology, Cambridge, MA; University of California, primarily at Berkeley and Los Angeles, CA; SRI International, Menlo Park, CA; Cornell University, Ithaca, NY; University of Southern California, Los Angeles, CA; University of Illinois, Urbana, IL; Texas Tech University, Lubbock, TX; University of Arizona, Tucson, AZ; and Carnegie-Mellon University, Pittsburgh, PA. In total, there are 340 contractors with 1,100 contracts or grants.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: This program element has thirteen projects. Four of these projects, 2309, 2311, 2312, and 2313, are under $10 million in FY 1984. However, full descriptions of these projects are included below to provide the full scope of the Air Force Defense Research Sciences Program.

Program Element: #61102F
DOD Mission Area: #510 Defense Research

Title: Defense Research Sciences
Budget Activity: #1 Technology Base

8. (U) PROJECT 2301 Physics (PROJECT OVER $10M IN FY 1984).

A. (U) Project Description: All Air Force systems, from space surveillance systems to transport aircraft, are deeply dependent on accurate knowledge of the underlying physical principles. Whether the question is safety and reliability of explosives, the ability of a laser weapon-guidance beam to read the target through a rain shower, or more detailed understanding of combustion processes to develop a more powerful fighter aircraft engine, the study of basic physical processes is often the best source of answers. Continued progress and prevention of technological surprise require a dynamic research program in physics. This project provides scientific information to the technology base to help solve Air Force problems in new weapon systems development, electromagnetic countermeasures, nuclear weapons effects, nondestructive and nonintrusive testing and analysis, and new materials development. To provide the necessary scientific knowledge, work is supported in optical physics, plasma physics, atomic and molecular physics, particle beam technology, and physics of collective phenomena.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: (1) High extraction efficiency free electron lasers were experimentally demonstrated for the first time. A three percent single extraction efficiency was demonstrated at 10 microns using a suitable variable wiggler, validating the theory. A free electron laser is believed to be scalable to large power devices and overall efficiently in the 20-50% range. (2) From basic microscopic principles, a new, fundamental theory of ion-ion recombination has been established for a general gas density, general ion density, and as a function of time. This is a solution to a long outstanding basic theoretical problem and has direct significance in a number of technological areas such as chemical reactions in dense gases and plasmas and development of high energy lasers. (3) Research in collective electromagnetic effects in plasmas has led to the highest power microwave radiation ever produced by the negative mass instability. This source offers the possibility of scaling to relatively small sizes and could have important uses in communications, radar, electromagnetic warfare, and directed energy systems. (4) A new theory has been formulated to describe superconductors with the highest known critical magnetic fields. This research predicted that $EuMo_6S_8$ is a superconductor. It was later confirmed experimentally. This is an important tool in the search for new materials that can operate in a much wider range of environmental conditions.

(2) (U) FY 1983 Program: Demonstration of recovery of the energy from an electron beam in a radio frequency linear accelerator is in progress. This is the last key principle in the feasibility demonstration of high efficiency, ultra high energy free electron lasers using radio frequency linear accelerators. Funding for studies of the generation of incoherent and coherent x-rays has been increased and the application of these sources to material studies is being initiated. Pulsed-power studies remain level, while funds for specific aspects of particle acceleration, propagation, and detection are being increased. Funding for studies of countermeasures to particle beams has been increased. The thrust in the directed energy area is being continued. Emphasis is being shifted from collective effects acceleration studies to advanced high efficiency radio frequency sources. Propagation experiments (especially ion beam propagation) and pulsed-power studies (specifically the exploration of advanced switching concepts such as plasma instability and optogalvanic switches) are being expanded. Space-based prime power research now includes such basic studies as dielectric behavior at high temperatures, advanced thermodynamics, high energy density storage, photovoltaics and photoionics, and high-pressure electrochemistry. An effort in collective mechanisms for the enhanced production of radiation is probing the

generation of radiation from plasmas at frequencies centered about the soft x-ray, microwave, and millimeter wave regions of the electromagnetic spectrum and emphasizes research relevant to potential applications in communications, radar, electromagnetic warfare, directed energy weapons, nuclear weapons effects, and microcircuits fabrication. Increased support in the quantum and statistical theory of energetic materials is being applied to address problems in high explosives for conventional weapons systems.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Energy recovery studies in free electron lasers will be completed, thereby demonstrating, individually, the feasibility of all of the elements necessary for high energy, high efficiency devices for laser weapons and other applications of high importance in the immediate future of the Air Force. Photochemical materials processing and diagnostic efforts will be expanded, adding dramatic power to the revolutionary capabilities which miniaturized electronic devices are now providing. Research will be continued in those scientific areas expected to contribute to the development of directed energy weapons. In the area of particle beams, research will be conducted on the creation and neutralization of negative ion beams for exoatmospheric applications. Theoretical studies of the propagation of neutralized and ion beams from the exoatmospheric region into the atmosphere are planned. Advanced particle beam research areas such as microparticle acceleration will receive new emphasis, as will countermeasures research. Electron propagation research will be phased down in favor of ion/plasmoid experimental work. Pulsed-power studies will remain constant, space-based prime power generation research will be further expanded, and funds for aspects of particle beam acceleration and detection will be increased. The preceeding particle beam research efforts are important factors in the goal of rapidly building the technology base for making practical, effective beam weapons. The plasma phenomena that emerge as the most promising mechanisms for the creative production of radiation will be subjected to intensified research. This research will lead to lighter, more compact, more efficient, and therefore more widely employable transmitters for generating the shorter wavelength radiation toward which the world is rapidly moving for future communication, radar, missile guidance, and jamming equipment. Increased emphasis will be placed on relating the fundamental, microscopic properties of explosives to the macroscopic behavior of interest in conventional weapons systems, striving to build a solid scientific knowledge base permitting development of more effective and more attack-resistant conventional munitions. New emphasis will be placed on investigation of vacuum ultraviolet and x-ray optical materials to enhance the development and utilization of coherent optical sources at these wavelengths. A specific initiative will increase funding of short wave-length laser sources to capitalize on the smaller, more compact, and more powerful potential inherent in short wavelengths and their use in weapons, communications, lithography, and other coherent radiation applications. Specially designed free electron laser accelerator facilities will be initiated to demonstrate that the elements can work together to produce high energies, and to increase the number of separate studies which can be performed to address numerous scientific problems. An expanded effort in x-ray sources will probe the basic physics necessary for the generation of directed energy at x-ray wavelengths. In addition, increased attention will be given to the development of new sources, pumped chemically, in the visible and ultraviolet spectral regions.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

Program Element: #61102F
DoD Mission Area: #510 Defense Research

Title: Defense Research Sciences
Budget Activity: #1 Technology Base

9. (U) PROJECT 2303 Chemistry (PROJECT OVER $10M IN FY 1984).

A. (U) Project Description: Advances in chemical research will underlie future advances in a broad range of technologies. The Air Force program is designed for maximum impact on the highest priority requirements in the technologies of materials, electronics, weaponry, power generation and geo-enviromental characterization. Specific topics include: (1) synthesis and characterization of materials for utilization in structural composites, lubricant systems, sealants, and fluids; (2) atmospheric chemistry responsible for influencing the operational Air Force environment; (3) methods for synthesis of advanced ingredients for rocket fuels and explosives; (4) electrochemical processes important for improved batteries; (5) new analytic methods for utilization in combustion diagnostics; and (6) energy conversion processes fundamental to high energy laser development.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: (1) Past progress in high strength ordered polymer fibers yielded tens of pound yields of the strongest, stiffest known synthetic material (up to 25% beyond best competitive fibers). Still larger scale fiber production is now planned under exploratory development. Breakthroughs in ordered polymer synthesis have afforded almost 100% conversion of starting materials from liquid crystalline solutions to ordered polymer films with (two dimensional) strength comparable to best (one dimensional) fibers. (2) A new class of isotropic composites has been synthesized and evaluated based on a tailored polymeric matrix reinforced with ceramic particles of uniform size, spherical shape, and controlled surface purity. While the strength of this composite is not yet as high in the preferred direction as conventional fiber laminated composites, the advantages already achieved are: less expensive processing, no delamination, and uniform strength in all directions. (3) Effective design and optimum operation of large-scale hydrogen fluorine chemical lasers require the detailed understanding of how reaction energy is deposited in higher rotational states of the product. Conventional computer models of lasers consider only vibrational energy emission at 3-4 microns. Research in energy transfer kinetics has revealed that all future modelling must consider both lasing from high-level rotational states and longer wavelength emission which never leaves the laser cavity, thus limiting the measured output efficiency. The associated frequencies can be absorbed by optical coatings which are, thereby, heated and destroyed. (4) Earlier research has shown that, by pyrolysis, polymers of carbon-silicon-hydrogen (polycarbosilanes) can be transformed in high yield to a high purity, ceramic, silicon carbide. A useful technique is provided for low cost ceramic and ceramic/glass composite materials. This discovery exploits the chemical analogy of the common organic (carbon-based) chemistry with less common inorganic (silicon-based) chemistry. A further major advance has been the discovery, for the first time, of a carbosilane with a silicon-silicon double bond analogous to the common place carbon-carbon double bond. The carbon analogue is an important basis for synthesis of practical polymers; the same eventual payoff is foreseen in silicon compounds.

(2) (U) FY 1983 Program: Technical emphasis continues in four areas: molecular kinetics, non-metallic structures, surface dependent properties, and synthesis. Included in molecular kinetics are the rates and mechanisms of chemical reactions, the dynamics of energy transfer processes, and applied spectroscopy for chemical analysis. Application of this research is found in the prediction of the spectral range of atmospheric background radiation in the infrared in order to optimize space surveillance systems. The same scientific approaches are exploited in development of optimum performance high energy chemical lasers to emit visible as well as infrared radiation. Non-metallic structures research

addresses polymers, ceramics, and glass including advanced concepts in composite materials. Molecular reinforced polymer composites, in films and bulk structures, are under investigation. New emphasis is placed on low density, rigid, dimensionally stable glass-ceramic composites for large spacecraft structures. Parallel efforts are underway in analytical characterization of structural response and new concepts for active and passive control. The program in surface dependent properties addresses oxidation resistances, lifetime limits to optical coatings, and the surface effects in electrodes and thin film electronic devices. Research in synthesis is directed at storable, energetic propellant ingredients; processible, higher performance composite matrix resins; and advanced hydraulic fluids with controlled viscosity and high temperature stability.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The initiative investment in materials and structures for spacecraft will continue along with the core investment in the four general topics given above. The relative investment will grow in surface chemistry with broadly applicable research on surface structures, adsorption, and diffusion. Understanding these phenomena will afford future advances in higher speed, submicron scale integrated circuits. Research in polymers will consider the molecular basis for electrical conductivity and the potential of polymers for electronic devices with circuit elements at scales of hundredths of microns. Past accomplishments in three-dimensional polymer ceramic composites will be extended to include stronger matrix-particulate interactions and new ceramic reinforcement materials. New concepts for short (visible) wave-length chemical lasers will be explored based on collisional energy transfer from an energized reaction product to a second emitting species in the gas phase. This research will provide the basis for future laser weapons that are more efficient, powerful, and lighter weight than infrared systems currently under development. Research in electrochemistry will emphasize electric field effects on electrode surfaces and in transport mechanisms in electrolytes for future battery systems of increased reliability and lower weight than present. Successful transition of research in molecular self-reinforced structural composites to development will permit growing programs in new polymers for non-linear optical materials for signal processing and new microchemical approaches to the process science of high strength, lightweight ceramic composites. These composites will provide a revolutionary new structural material for application in turbine engine hot-section components as will as load bearing structures for on-demand transatmospheric flight vehicles.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

10. (U) PROJECT 2304 Mathematics (PROJECT OVER $10M IN FY 1984).

A. (U) Project Description: The research in mathematical sciences seeks discoveries of mathematical and computational ideas that provide understanding and solve problems of critical importance to the Air Force. The topics cover a very wide range, from immediate practical concerns of computation and software production to the investigation of general concepts in artificial intelligence and mathematical turbulence. Applications of the results include control of aerospace systems; aerodynamic design of aircraft, missiles, or other weapons; efficient production of large-scale well-documented computer programs and software; communication and information theory; artificial intelligence in surveillance systems or in independent weapons; reliability, availability, and maintainability; and the allocation of

Program Element: #61102F
DoD Mission Area: #510 Defense Research

Title: Defense Research Sciences
Budget Activity: #1 Technology Base

resources in logistic or operational activities. The research is divided into six program areas: control theory, computer science, computational mathematics, physical mathematics, probability and statistics, and system theory.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: (1) A new and different statistical approach based on Bayesian techniques has been applied to the planning of the MX flight test program. This new technique reduced the number of planned test flights in Phase I from 36 to 25 and simultaneously increased the confidence level to be obtained for the test results from 72% to 93%. The savings to the Air Force by using this approach in Phase I is estimated to be more than $250M, and even greater savings are anticipated by using the same approach in the succeeding phases of the MX flight test program. This kind of approach should have applications in testing a wide variety of Air Force systems. (2) Sparse matrix methods have been established to provide speed increases of an order of magnitude or better in massive computations carried out on vector processors used in the largest and most expensive scientific computations. One of these methods has been integrated into the SPICE 2 electronic circuit analysis program, which is employed in the design of very large scale integrated circuits. A speed-up in computation of a factor of six has already been obtained for a circuit with about 300 active elements; factors of ten or better are expected for large circuits with about a thousand elements. Routine calculations that would take a day of supercomputer time can now be done in a few hours with the savings of tens of thousands of dollars for each calculation. (3) Solitons are isolated waves that occur as solutions in a variety of systems described by nonlinear partial differential equations. Examples are pulses of light in fiber optics, oscillations within Josephson junctions, and coupled field-electron waves in crossed-field microwave amplifiers. Since the systems are nonlinear, they are very difficult to understand; and progress has been slow. Recently a technique called the inverse scattering transform has been extended to describe solitons in two space dimensions. The insights that lead to this extension should apply to solitons in three space dimensions and promise a much better understanding of these nonlinear processes.

(2) (U) FY 1983 Program: A major new initiative is being undertaken to use computer science methods, including artificial intelligence, synergistically with human visual techniques and optical processing to investigate research problems in image understanding. A particular focus of this thrust is the processing of images from spacecraft. The initiative investigating artificial intelligence methods for autonomous systems that can sense, reason, and act alone is continuing. Significant emphasis in the computer science program is on the exploration of techniques for rapid computer assisted software development and on fundamental algorithms for the analysis and design of very large scale integrated circuit layouts. Reliability is a significant focus of the work in probability and statistics, in preparation for an initiative in this topic in FY 1984. The emphasis in stochastic processes is maintained, with work in nonparametric signal processing playing an important role. Multivariate analysis continues. Computational mathematics with a concentration on the study and development of algorithms suitable for vector processors and highly parallel computing machines occupies an increasing part of the resources of the project. Closely related work in numerical grid generation continues. New efforts are starting in distributed control theory with potential application to flexible space structures or to deformable mirrors for lasers. Challenging problems involve finding good methods for controlling systems with many degrees of freedom using approximations with few degrees of freedom. Funding is increased in the study of essentially nonlinear models of physical processes. The main emphasis is on solitons, bifurcation, and chaos. Numerical experimentation defines appropriate mathematical properties for study. Applications of recent advances in differential geometry to engineering system theory

are being studied, and new efforts include research on techniques for achieving high performance digital filters with small numbers of taps for implementation by charge coupled devices.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: A new initiative will be devoted to the study of more realistic models of the mechanisms of failure, repair, and replacement of components and subsystems used by the Air Force. The aim is to come to grips with central problems that have caused estimates of total life cycle costs to be low by an order of magnitude or more. The models will include effects of gradual degradation of components; of partial or incomplete repair; of replacement by components that may be better, worse, or just different from new; of intermittent destructive shocks to the system; and of dormancy. Promising ideas that have been discovered by Air Force supported research in this topic will be exploited. Results in this area should help significantly in understanding and reducing life cycle costs. The work on development of stochastic theory and its applications in nonparametric signal processing will continue, and multivariate statistical studies will hold steady. The emphasis on fast algorithms for pipeline and highly parallel computers will continue in preparation for the FY 1985 initiative in this area. Computer architectures that fit the needs of promising algorithms will be sought. The applications of computation to partial differential problems in three-dimensional space will serve as a motivator for much of the computational research. The studies undertaken in the initiatives on image understanding and autonomous systems will continue. The image understanding initiative aims to advance the science needed for automatic analysis of images from space-based sensors; the autonomous systems initiative seeks foundations for the design of intelligent Air Force weapon systems that can sense, decide, and act independently. New work on communication issues related to computer security is anticipated. New emphasis is expected in data management systems including intelligent interfaces and techniques for representing, and algorithms for searching diverse data including free form text, graphics, image, and voice. Distributed systems in control theory will receive more emphasis, and studies in decentralized control are planned. In this and related topics, control algorithms that can be effectively implemented on microprocessors will get more attention. Communication between computers will receive increased support. This area is becoming important in communication, command, and control. The possibility for fault tolerant design in very large high speed integrated circuits will be investigated. In chaos, bifurcation, and solitons, the funding is anticipated to remain about constant.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

11. (U) PROJECT 2305 Electronics (PROJECT OVER $10M IN FY 1984).

A. (U) Project Description: The electronic research program provides the fundamental knowledge required to advance the Air Force capabilities in surveillance, guidance and control, information and signal processing, communications, and command and control. These topics include optical signal processing for target recognition and terminal guidance; compound semiconductor devices for high speed digital signal processing and for microwave power generation; electromagnetic propagation; antennas; target signatures; microwave tube science; magnetostatic and electro-acoustic analog signal processing devices; integrated optics for advanced gyroscopic sensors; robust communications techniques for command and control; and nuclear radiation hardening.

Program Element: #61102F
DoD Mission Area: #510 Defense Research

Title: Defense Research Sciences
Budget Activity: #1 Technology Base

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: (1) A new type of transistor has been fabricated that offers improved reliability and radiation hardness compared to conventional gallium arsenide field effect transistors. The new device uses alloys of gallium arsenide and aluminum arsenide to eliminate metal to semiconductor contacts that are a major reliability problem in conventional high speed transistors for radar and microwave communications. (2) A simple, and hence high speed, method has been discovered for calculating phase adjustments to large airborne antenna arrays that can correct for geometric distortions due to flexing of the airframe. This should allow spreading the antenna elements along the entire fuselage, resulting in much higher resolution radar images than can be obtained from the small rigid arrays currently in use for reconnaissance and surveillance. (3) A new type of high efficiency lens has been demonstrated for focusing laser beams in integrated optics circuits. The new lens uses diffraction effects from an easily fabricated array of curved grooves to produce sharply focussed laser spots with very little loss of light compared to complex refractive lenses. This advance will greatly lower the cost of fabricating integrated optical circuits for electronic warfare and surveillance systems. (4) Cosmic rays have caused upset of computers and other electronics in space satellites in recent years. It was feared that this ionizing radiation would limit the complexity of integration that could be installed on spacecraft. A detailed study of the phenomena has now revealed the unexpected result that these deleterious effects reach a limit at about the present complexity of computer memory circuits and will diminish in harmfulness as greater complexity circuits become available.

(2) (U) FY 1983 Program: The research initiative on manufacturing science that was begun in late FY 1982 has reached full strength, with centers of excellence established at Stanford University and the University of Michigan to perform research on robotics for the assembly and test of small batch lots of aerospace assemblies. Mechanisms for strong interaction with the aerospace industry were established via industry advisory boards and provisions for visiting industrial scientists at the centers. The research thrust on ultrasubmicron electronics concentrates on increasing the capability to measure and characterize electronic circuits and materials when the dimensions of the circuit features are smaller than the 10,000 angstrom goal of the Very High Speed Integrated Circuit Program. Analysis techniques capable of 100 angstrom spatial resolution and time resolutions of sub-picoseconds are being pursued. A strong research effort is being conducted to advance analogue signal processing devices and circuits. In addition to the surface acoustic wave and magnetostatic wave research, new programs in sub-surface acoustic wave processors and superconducting processors are being conducted with emphasis on devices suitable for operation in intense jamming and electronic countermeasures environments. Research on fiber optic ring laser gyroscopes is shifting to improving their long term stability now that major breakthroughs have been made in their short term stability. These devices offer the potential for better accuracy of aircraft navigation and ruggedness and compactness compatible with application to missile guidance.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: A major new thrust will be initiated to pursue optical and superconducting signal processing circuits having the capability to preprocess massive volumes of data prior to input into digital integrated circuits of the type being advanced under the Very High Speed Integrated Circuit Program. The optical processing research will build on a base of knowledge established in prior years on optical signal processing that has shown the potential of these techniques to process many streams of data in a parallel fashion to achieve extremely great throughput. Superconducting analogue circuits have shown a similar throughput potential because of their great speed and very low-power consumption. Materials research will be conducted to support the device

investigations, especially on optical polymers, superconductor-insulator junctions, and on laser assisted fabrication and alteration of signal processing devices. Primary applications of this research initially include command, control, communications, and intelligence, where fixed installations are necessary; and eventually tactical reconnaissance and weapon delivery as the signal processors become more compact and lightweight. Research on electronic warfare will be expanded significantly. Topics of high interest to advanced countermeasures techniques will be studied including deception jamming, terrain scattering, and antenna characterization. It is planned to revitalize the university based research in support of this important defense topic.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

12. (U) PROJECT 2306 Materials (PROJECT OVER $10M IN FY 1984).

A. (U) Project Description: The goal of the Air Force materials research program is improved performance, cost, and reliability of both structural materials and electronic materials through fundamental knowledge of the science underlying the application of these materials to Air Force missions. The structural materials research program studies a broad range of material properties such as strength, fatigue resistance, and corrosion resistance of airframe and turbine engine materials with primary emphasis on titanium, aluminum, and nickel based alloys as well as ceramics. A strong program of research in non-destructive evaluation of these materials complements research on improved properties. The electronic materials research program is concerned with semiconductor, optical and magnetic materials of interest for avionics, surveillance, communications, guidance, and electronic warfare. Emphasis is placed on compound semiconductors, superconductors, surface acoustic wave and magnetostatic wave materials, fiber optic and integrated optic materials, and high purity quartz for time and frequency standards. An increasing program of research on reliability of semiconductors and on their radiation hardness complements the research on improved properties.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: (1) A large number of cyclic fatigue failures in gas turbine engines originate at local stress points such as notches and boltholes. An explanation based on high temperature stress studies has been found for the reduced life of these parts compared to smooth test samples. This finding will greatly improve the service life predictions for such components. (2) A major advance has been achieved in the ability to analyze the electrical and physical characteristics of material surfaces through the demonstration of a high resolution (200 angstrom) ion microscope. The contrast in the images is very sensitive to crystallographic and topologic features of the surfaces and is expected to provide a powerful new tool for analysis, not only in structural materials and electronics, but also in other fields such as biology and medicine. (3) A method of depositing inorganic photoresists has been established that allows their use in integrated circuit fabrication in the same manner as conventional organic photoresists, namely by coating the semiconductor wafer with a liquid solution and spinning the wafer at high speed. Significant savings in circuit costs as well as wholly new circuit geometries are conceivable using this new technique. (4) Flouride glasses have been synthesized that exhibit a very wide range of transparency, making them very attractive for optical radomes and windows for aircraft and missiles whose sensor systems may include visible television cameras as well as infrared viewers or seekers.

Further theoretical research in support of the material synthesis program has produced an accurate theory for identifying the most promising ranges of glass compositions to be explored for further exploitation of these glasses.

(2) (U) FY 1983 Program: A new research effort is beginning on improving the survivability of satellites through greater resistance to laser radiation and improved convertness. This initiative is investigating novel materials for the absorption and dissipation of high energy laser radiation to determine the likely limits of protection to spacecraft that can be provided by a sacrificial sheild. Effects of dazzle and obscuration resulting from ablation of the shield in a space vacuum environment is being analyzed. In addition, materials that can obscure a satellite from optical, infrared, radar, and millimeter wave sensors are being sought to hamper detection by surveillance systems and to confuse terminal homing anti-satellite weapons. The structural materials research concentrates on life limiting fatigue, corrosion, and cracking properties of high temperature materials to enhance service life of airframes and turbine engines. The metals processing breakthrough in die design is being extended to prediction of forging parameters for more complex part shapes to reduce the current long lead time for tooling and forging dies.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Research in FY 1984 will concentrate on metals and ceramics with potential for improved high temperature gas turbines for greater thrust-to-weight ratio aircraft engines giving improved aircraft maneuverability and fuel efficiency. Non-destructive evaluation research will be conducted to increase the service life and reliability of aircraft engines and airframes, especially those using the new composite materials that have high strength and low weight. Powder metallurgy research will seek increased engine durability and reduced need for critical materials. Semiconductor device research on compound semiconductors will be redirected from characterization and processing of bulk gallium arsenide to growth, characterization, and processing of multilayer compounds for high frequency microwave sources and high speed digital signal processors to enable future avionics to function in a hostile electronic warfare environment. Optical detector materials will be improved for surveillance optics, missile seekers, and fiber optic communications systems. Research in optical storage, optical processing and electrooptics will be increased to enhance our capability to process large volumes of data in real time tactical situations. Materials research will be conducted to improve the survivability of satellites against laser attack and other anti-satellite threats.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

13. (U) PROJECT 2307 Mechanics (PROJECT OVER $10M IN FY 1984).

A. (U) Project Description: Mechanics research provides fundamental knowledge pertaining to aerodynamics and structural principles required for improving the efficiency, effectiveness, and safety of current and future Air Force aerospace vehicles, and civil engineering technology for field installations. Investigations are conducted in fluid mechanics, solid mechanics, flight dynamics, and soil and field structure mechanics. As we look toward the future, we see the need for more flexible and maneuverable aircraft with active controls which will be more fuel efficient and reliable, and capable of operating from shortened or damaged runways. We see larger, more flexible spacecraft requiring accurate figure control and pointing accuracy. These needs indicate research directions in understanding flow and drag characteristics in fluid mechanics, lighter weight structures, and structural dynamic-control interactions. The results of this work provide the generic aerodynamic and structural technologies with new insights and concepts necessary to assure the design and production of superior aerospace weapon systems and installations.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: (1) An understanding of the behavior of vortical structures which are produced in the shear layer of an impinging turbulent jet and which serve as the source of large amplitude pressure fluctuations and resultant aerodynamic noise has been exploited to optimize the design of a space-based chemical laser configuration. A knowledge of the acoustic feedback process which can initiate near the impingement surface and lead to flow resonance has aided designers of the novel laser cavity which employs a reflecting shroud to achieve a 50% volume reduction over other competitive configurations and a savings of 20% in shroud weight. (2) A numerical prediction technique has been demonstrated for interfering bodies in supersonic flow in which the effects of reflected shock waves dominate. This solution of the Euler equations includes logic for shock fitting and for handling the transition from regular shock reflections to Mach reflections. Its accuracy has been established through comparisons with experiment for flow past an axisymmetric body in close proximity to a flat plate. This research provides the basis for development of engineering methods to predict the aerodynamic characteristics of aircraft with stores in supersonic flight. (3) A new experimental methodology has been developed using optical interferometry for determining high resolution three-dimensional crack front geometry. This crack front geometry data differs significantly from the predicted geometry using linear analysis, and provides the basis for accurate nonlinear modeling of crack tip behavior. (4) The effects of changes in the state of stress in a soil mass on measured values of dynamic soil properties have been demonstrated, and predictive models have been formulated for wave propagation velocities and moduli of dry sands. Experimental results obtained under three-dimensional stress states reveal that only the stress component in the direction of wave propagation affects compressive wave velocity. Similarly, only stress components in the directions of particle velocity and wave propagation affect shear wave transmission. This insensitivity to out of plane stress components has not previously been accounted for in missile site analyses.

(2) (U) FY 1983 Program: The FY 1982 initiatives in fuel efficient aircraft and low speed take-off and landing are being emphasized. In fluid mechanics, research in the transonic regime is focusing on three-dimensional flows with strong shock waves and significant viscous interaction effects. Funding of experimental characterization of turbulence structure and laminar-turbulent transition has decreased slightly to accommodate increases in analytical modeling and computation of turbulence. Emphasis in computational grid generation procedures is on adaptive grids which maintain the most dense portions of the grid in regions of large gradients as the solution evolves. In internal fluid dynamics, emphasis is on computational methods for flows through complex geometries and on time dependent flow in axial flow compressors. The solid mechanics program is implementing an initiative in flexible spacecraft materials and structures. Included are identification and modeling of structural response mechanisms for the dynamic environment of global vibration modes and wave propagation. These mechanisms are necessary for the development of active and passive controls for large space structures. Studies in aeroelasticity and aircraft engine structural dynamics are continuing with emphasis placed on modeling and computational aspects of fluid-structure interaction. Mechanics of composite materials studies are concerned with damage mechanisms and the application of stochastic methods to life prediction models. In airbase structures research, degradation of dynamic properties (shear modulus, strength, seismic parameters) of compacted backfill materials

brought about by variations in environmental conditions (wet-dry cycles) and load history is being emphasized. The resulting changes in soil fabric and stress-strain relations will be incorporated into structure-media interface models. Dynamic fracture characteristics and strengths of reinforced concrete structural elements and stabilized soil pavement layers are being modeled to predict structural response to blast loadings and aircraft wheel loadings on alternate launch/recovery surfaces.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The turbulence program will achieve a balance which emphasizes the identification and characterization of shear layer structures in transitional and fully turbulent flows, analytical modeling and computation of large scale turbulent structures, and the effects of passive, active and interactive control techniques on the physics of boundary layers and free shear flows. The payoff is reduced drag (more than 10% demonstrated in the wind tunnel) and enchanced mixing in combustion, lift augmentation, and lasers (doubled efficiency has been demonstrated). Computational fluid dynamics methods will be used to simulate the evolution of turbulence structure in laminar boundary layers and the turbulent bursts in fully turbulent boundary layers. Multigrid methods, adaptive grids based on error analysis, and algorithms suitable for vector processors will be investigated with the goal of increased computational speed and accuracy for the simulation of three dimensional solutions of the Euler and Navier-Stokes equations. Improved prediction methods will be sought for strongly separated flows with particular emphasis on more accurate turbulence models and on the capture of regions of vortical flow. Quantification of compressibility effects on jet interacting flows will receive emphasis as will computational methods for predicting steady and unsteady flow past wing/store configurations. More accurate and detailed heat transfer information will be sought in highly curved internal flow passages with and without film cooling. The solid mechanics program will emphasize fracture of nonlinear materials, the statistical aspects of early crack growth, analytical models for fabric preform and composite three-dimensional materials. Use of these composites will save structural weight and allow longer life operations. The microdynamics of structural components subjected to random transient loadings from aircraft ground maneuvers or space platform slewing will be modeled using both deterministic and stochastic methods. This will allow substantially improved structural control systems which would be applicable for aircraft operating from damaged or unimproved surfaces or large, high gain, flexible surveillance and communication satellites. The deployment dynamics of lattice type spacecraft structures will be studied analytically using non-linear models developed in previous years. The on-orbit dynamics of such structures in response to slew and orbital transfer maneuvers, fluctuations in thermal and electromagnetic radiation environments, and micro-meteorite impacts will also be studied with a view towards identifying conditions critical to design load determination. Design optimization objectives will be pursued through interdisciplinary modeling, simulation and sensitivity studies. The mechanics of composite structures having multi-directional and multi-dimensional reinforcement weaves will be studied considering mechancial, thermal and radiative environments of various combinations. Emphasis will be on the identification of failure processes as functions of constituent material properties and geometrical configurations. Studies will begin to define the wave transmission characteristics of structural systems consisting of thick layers of materials of widely varying strength and stiffness properties, to include concrete burster slabs/compacted backfill/rubble zones of large unbound particulates. Emphasis will also be placed on quantifying the effects of partial saturation on the stress-strain behavior of soils. These studies will impact siting and design of missile sites, aircraft shelters, and runways.

(4) (U) Program to Completion: This is a continuing program.

Program Element: #61102F
DoD Mission Area: #510 Defense Research

Title: Defense Research Sciences
Budget Activity: #1 Technology Base

C. (U) Major Milestones: Not applicable.

14. (U) PROJECT 2308 Energy Conversion (PROJECT OVER $10M IN FY 1984).

A. (U) Project Description: This project is concerned with reacting flows, combustion, and propulsion. The areas in which new knowledge is being sought include: combustion and ignition phenomena associated with rocket and aircraft engines, both present and future; advanced diagnostics and instrumentation needed to advance propulsion, materials, and weapons technologies; and improved safety in the use of energetic materials. For rocket propulsion, we need improved payload range capability while avoiding detectable plumes and destructive instabilities. For orbit raising, we need many fold improvements in system efficiency. For airbreathing propulsion, we need more uniform, higher temperature combustion with improved durability and combustion stability. These needs indicate research directions in reactive flows, combustion instabilities, diagnostics, energetic materials, and non-conventional propulsion. The goal is to reduce the cost and to increase the flexibility and performance of future Air Force systems.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: (1) Advanced combustion models were established and validated which accurately predict combustor performance and turbulent reacting flows. The models have been applied to ramjet, turbojet and air-augmented rocket analyses programs. A new empirical analysis was discovered which accurately predicts blow-off velocity of bluff-body stabilized flames. The analysis will be useful in design of afterburners and in development of techniques for attenuating aircraft external surface fires. A new vortex combustion model was established which accurately predicts the onset of acoustic combustion instability. The model provides a tool for the prediction of unstable combustion in full scale combustors when the fuel is changed. A new theory was conceived and experimentally validated which predicts the critical parameters of fuel-air explosive mixtures (e.g., minimum cloud size for detonation, minimum ignition energy) from the detonation wave cell size alone. The theory and data are being used for scaling-up inexpensive laboratory scale tests to field scale, and in evaluation and development of improved fuel air explosion weapons. (2) Spatially and temporally-resolved temperatures and multi-species in turbulent flames were measured using absorption techniques and detector arrays. This technique provided, for the first time, instantaneous data required for the development and validation of turbulent combustion theories. (3) Large increases in base drag reduction of rockets were achieved by establishing a technique for optimizing the position of the base burning flame zone. This will lead to increased range.

(2) (U) FY 1983 Program: The FY 1983 initiative in space power and propulsion addresses the scientific issues underlying future space system requirements including power generation and beaming; plasma interactions; thermal management technology; and more energetic propellants. Emphasis is being directed to diagnostic methods applicable to reacting flows. The dynamics of high-speed turbulent and transient chemically reacting flows are being investigated. Research on pyrolysis and oxidation kinetics of hydrocarbons is continuing with emphasis on aromatic hydrocarbon constituents of future fuels. Research continues on exploring phenomena associated with undesired ignition. Research is being conducted on alternate means of ignition and flame holding for airbreathing engines. There are increases in efforts pertaining to the combustion of alternative fuels and high-energy/high-density fuels (e.g., carbon and boron slurries), ramjet combustion instability, and supersonic and dual mode (subsonic and supersonic) combustion. Efforts are continuing on particulate and soot formation and on other combustion generated exhaust emissions. Efforts are being initiated to explore the phenomena

associated with rocket motor combustion to provide knowledge needed to improve performance and efficiency. Research is underway to understand the processes required to rapidly and efficiently burn metals. The potential of realizing improved propellants through additional research on synthesis of energetic binders is being addressed. Emphasis is being placed on nonconventional propulsion for orbit raising of large payloads. Research on electrode erosion and plasma stability will increase the power levels and efficiencies of magnetoplasmadynamic thrusters. Research of the ignition and stability of laser sustained plasmas addresses the performance limits of beamed energy propulsion.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The FY 1983 initiative in space power and propulsion will have increased efforts in innovative thermal management techniques and extremely high power density energy conversion, such as meta-stable helium. This will provide the science options which will be the basis for the order of magnitude increases in power and four-fold increases in orbit-raising propulsion needed for the large communications, surveillance, and weapons satellites of the 1990's and beyond. Several of the approaches resulting from the research initiatives on nonintrusive techniques to obtain reliable experimental measurements from reacting flows will be validated and compared to theoretical results. Attention will be given to advanced diagnostics for performing research on energetic materials, particularly condensed phase processes. Research will continue on new techniques which are essential to understand combustion systems, airbreathing and rocket engines, effective fuel utilization, and exhaust plume signatures. Continuing research will be directed at the dynamics of high-speed turbulent steady-state flows and transient chemically reacting flows with emphasis placed on realistic modeling and characterization of the flow field, processes, and phenomena occurring in dump-type ramjet, gas turbine, and ducted rocket combustors. The goals are to provide more uniform and stable combustion for higher performance, more fuel efficient, and more reliable engines. Attention will be given to establishing the research needs associated with the combustion of alternative fuels and high-energy, high-density fuels; ramjet combustion instability; and ducted rocket and supersonic/dual mode combustion. Physical and chemical reactions in rocket plumes along with a number of radiation phenomena will be studied in Air Force laboratories and through contracts. Efforts relating to rocket combustion dynamics will continue to be emphasized with the long range goal of making a priori assessments of the likelihood of stable motor operation. These studies will lead to higher performance, more reliable, less detectable rocket motors. This will be the third year of the research to understand the processes required to burn metal, in particular boron, in ducted and ram rockets fueled by either slurries or solid propellant gas generators, to provide significantly higher propulsion efficiencies.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

15. (U) PROJECT 2309 Terrestrial Science (PROJECT UNDER $10M IN FY 1984).

A. (U) Project Description: The capability of a ballistic missile to strike a target on the other side of the earth is derived directly from accurate knowledge of many aspects of terrestrial sciences. The very stringent accuracy requirements of the new missile generation demands increasingly detailed understanding of the earth and motivates research objectives in missile system guidance, control, and delivery; advanced guidance component testing; and missile site selection. Research in geodesy is required to determine the exact position of targets with respect to missile launch sites. Research in gravity is required to determine its effect on missile guidance systems along flight paths. Research in seismology is required to determine the effects of earthquakes, nuclear explosions, and other natural or system-generated noise on the degradation of missile guidance systems before launch.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: (1) The precision of a satellite radio interferometry system capable of quickly measuring distances with geodetic precision has been demonstrated. This system, called Miniature Interferometric Terminals for Earth Surveying (MITES), will enable the Air Force to establish the necessary precise geodetic positions of the MX missile sites while saving one to two orders of magnitude in time and expense. The demonstration survey between three Massachusetts locations agreed with the most modern National Geodetic Survey values to well within 10 cm in latitude, longitude, and elevation. Prime features of this new technique are ease of operation, all-weather capability, and short time required on station. (2) The Air Force requires the capability to sense the precise, minute motions of the earth at given locations. There are two applications for this capability: to establish practical limitations on the gound motion effects upon missile guidance systems, and to supply ground motion data for the testing of the extremely precise gyros and accelerometers required for new missile systems. Three different types (long baseline, shallow and deep borehole) of tiltmeters for measuring earth crustal motion were compared in southern California. At tidal (12 and 24 hour) periods these instruments agreed to within .02 arc seconds of each other and with theory, providing the first check that these different devices were accurately measuring this minute motion.

(2) (U) FY 1983 Program: A total of six two-frequency MITES instruments are being evaluated on their capacity for using satellite radio emissions to enable fast measurement of distance between ground points with geodetic precision. Precision location of ground points is vital for obtaining the accurcy demanded in new missile specifications. Air Force capabilities for precise positioning of missile test ranges, navigation aids, and missile sites as well as for ballistic and cruise missile targeting will be considerably enhanced when these instruments are operational. In satellite altimetry, newly derived tidal corrections along with single and double-point mass techniques are being used to construct a more accurate global geoid, another necessity for attaining the accuracy demanded of new missile systems. To further assist in this effort, the short-arc technique is being modified to process data from a new geodetic satellite with increased altimetry capability that will be launched in 1984. Analytical and computer-based numerical techniques are being developed to predict the nature and magnitude of ground motions that can be expected from earthquakes and distant nuclear attacks on land-based systems. Experiments are being conducted to detect low-frequency ground motions to set limits on concealment problems with missile basing. Ultrasonic techniques are being used to verify numerical computational methods and simulate motions at defense facilities. Hydroacoustic and infrasonic techniques are being investigated to better understand the detection of distant nuclear explosions.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Three MITES instruments will be located at radio astronomy sites to evaluate their capability to track NAVSTAR satellites and determine precise geodetic positions, a necessity for each missile launch site if the specified targeting accuracy is to be attained. To improve the global geoid and gravity field models, another important necessity in achieving the demanded targeting accuracy, studies of the feasibility of using cryogenic gradiometers in aircraft or satellites will be started. The new geodetic satellite will provide improved altimetrical measurements which will be used in conjunction with the short-arc reduction technique to update the global geoid. Supporting still another requirement affecting the new missile accuracy, the geophysical and

geological parameters required for the prediction of ground motion in MX sites will be finalized. Two complementary computer codes for predicting seismic wave propagation in complex geologic media will be completed and transferred to the Ballistic Missile Office for MX facility siting. Hydroacoustic and infrasonic research, topics very useful for the mission of identifying, locating, and characterizing distant nuclear explosions, will be expanded to include array processing techniques. New missile system accuracy specifications require that the minute variations in the earth's rotation rate be accurately detected, both for baseline data for testing the extremely precise guidance systems, and for input to the operational missiles. In support of this requirement, a passive optical ring cavity rotation sensor will be studied to determine dominant error sources, such as beam misalignment and scattering. Techniques will be devised to remove or ameliorate these effects so that the sensor will operate near its theoretical limit. The work will be preparatory to the construction of a large ring cavity sensor for detecting earth rotations in FY 1985.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not Applicable.

16. (U) PROJECT 2310 Atmospheric Sciences (PROJECT OVER $10M IN FY 1984).

A. (U) Project Description: The design and operation of Air Force aerospace systems are affected by such atmospheric properties as density, optical transmission, winds, temperature, precipitation and infrared emissions. The research program in atmospheric sciences involves the study of the earth environment from the earth's surface to satellite altitudes. Particular attention is focused on cloud and aerosol (e.g., haze, dust, etc.) properties impacting on optical and infrared weapons guidance and delivery systems, and on medium, or battlefield, scale weather prediction. Analyses of the dynamics and structure of the upper atmosphere and ionosphere are major research efforts directed at enhancing communications and surveillance systems capabilities.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: (1) Past perceptions about the need for high density meteorological data coverage for highly accurate weather forecasts may have been ill-founded. A series of numerical simulation experiments revealed that at least some medium-scale weather events are foreseeable from the existing density of meteorological sites across most of the United States. This finding must be confirmed, but indicates the future development of greatly improved local forecast models. (2) The results of a theoretical analysis of nonlinear gravity wave interaction with the atmospheric mean flow indicate that gravity wave interaction and subsequent turbulent dissipation can be responsible for significant dynamic changes in the atmosphere and the occurrence of weather on medium to small scales. Predictive models must now be derived to account for this energy exchange mechanism. (3) Laboratory and field studies of infrared and optical emissions in the upper atmosphere defined the infrared emission spectra of ozone and an oxide of nitrogen. These results are important to the comprehensive modeling of the upper atmospheric sources of infrared and optical background noise against which very sensitive detectors must operate. (4) Theoretical analyses and an innovative approach to existing auroral observational data revealed a heretofore unsuspected predictability in the diffuse aurora. This outstanding advance in understanding one aspect of the auroral zone emission furnishes us with a new diagnostic approach to high

latitude ionospheric dynamics as well as an important piece of knowledge for the auroral zone emission prediction models important to systems design and performance assessment.

(2) (U) FY 1983 Program: Medium scale weather prediction models are being advanced by efforts to include realistic accounting of small scale processes such as convective energy exchange and radiative diabatic heating. Very high frequency radar is being applied to investigations of the physics involved in weather development, especially along frontal systems and other classically recognized features. A new program to encourage innovation in satellite remote sensing concepts is starting, and an effort to develop a global cloud prediction model is being pursued. In ionospheric research, the results of a major 1982 field program in equatorial ionospheric modification, via chemical releases, are being evaluated and analyzed. The analytical effort to understand the temporal and spacial variability of the auroral zone ionosphere is continuing with a dozen research and funding agencies involved. Research into the source of high altitude infrared emission backgrounds is continuing to help define the useable infrared transmission bands of importance to design engineers.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The completion of a major new cloud simulation chamber will provide new opportunities for research in the formation and evolution of clouds, the aging of aerosol distributions and the propagation of optical and infrared radiation through fields of particulates, water droplets, and ice crystals. Involving multiple federal agencies and universities, this program promises to set the stage for the most significant advances in cloud and aerosol microphysics in the past decade, yielding new knowledge important to aircraft icing as well as electromagnetic signal propagation. A major field program to investigate medium scale weather development on the east coast of the U.S. will be encouraged and is expected to further our medium scale predictive modeling capabilities. Development of a numerical modeling theory for global prediction of cloud cover will be enhanced with the introduction of high resolution regional window models using fine mesh modeling techniques. Combined with improved satellite remote sensing techniques, a vastly improved capability to forecast cloud cover over specific operational theaters such as western Europe, with its persistent low visibilities and clouds, is anticipated. Modification of the ionospheric electron density structure by Air Force operations is an area of increasing concern. The potential for deliberate or inadvertent modification of the ionosphere will be investigated theoretically and in field experiments. This research must be initiated at this time in preparation for the multi-agency Chemical Release and Radiation Experiment Satellite Program. High latitude and polar cap ionospheric irregularities that develop in response to solar and magnetospheric influences will be investigated using theoretical modeling, multiple incoherent scatter radars, aircraft and satellite observations, and ground-based sensors. These studies will contribute directly to the development of predictive codes for the impact of ionospheric temporal and spacial variability on the performance of critical DOD systems at high latitudes, such as the frequency management codes necessary for reliable and predictive performance of the over-the-horizon-backscatter surveillance radar system currently being made operational.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

Program Element: #61102F
DoD Mission Area: #510 Defense Research

Title: Defense Research Sciences
Budget Activity: #1 Technology Base

17. (U) PROJECT 2311 Astronomy and Astrophysics (PROJECT UNDER $10M IN FY 1984).

A. (U) Project Description: Space environmental conditions produced by radiation and atomic particles can endanger the mission and degrade the performance of military spacecraft, disrupt the detection and tracking of missiles and satellites, distort communications and interfere with surveillance operations. This research project provides basic knowledge of the space environment for the design and calibration of advanced Air Force systems. The project also supports the Air Weather Service by improving observing and forecasting techniques that support operational military systems. Experimental and theoretical means are used to study: methods to improve space surveillance systems; solar outbursts and their travel to the earth where they affect communications and satellite systems; composition of the space environment in which Air Force systems operate and changes caused by natural and man-made disturbances; and the response of spacecraft systems and operations to the space environment.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: (1) Basic research on precipitating particles has led to the development of an index to determine a global specification of the equatorward boundary of auroral precipitation as a function of geomanetic activity. Computer software has been provided, installed, and is operational at the Global Weather Central (GWC) of the Air Weather Service. This application of a basic research result filled a critical void in GWC support to its customers. (2) Satellite sensors were designed to monitor the space environment and data analysis procedures established to determine the state of the global topside ionosphere for Air Weather Service and Space Division users. This work represents a major advance in the space forecasting ability of the Air Force, giving a mechanism for replacing ground-based observations with limited geographical coverage with satellite determinations of the space environment on a global scale. (3) Observations of solar flares have shown that such events penetrate to unusually deep layers of the solar atmosphere. This is indicative of the highly energetic character of these flares. Highly energetic flares generate relativistic protons which disrupt Air Force communications and detection systems and endanger astronauts, especially those in polar orbit as planned for many space shuttle missions.

(2) (U) FY 1983 Program: The work encompasses the physical mechanisms on the sun that give rise to solar emissions, the transport of particle and electromagnetic radiation through space, and determination of their effects on the magnetosphere/ionosphere system. Solar active regions, the coronal origins of the high speed solar wind, and the effect of magnetic fields on energy transport are being identified and studied to establish early recognition and predictive capabilities for Air Force systems. Auroral particle precipitation boundaries are defined as a function of time and geophysical conditions in order to provide improved Air Force space communications. Research is being carried out in the areas of ionized plasmas, wave plasma coupling, electric and magnetic fields with instruments being developed and flown on satellites and the space shuttle. The results are used to develop high-latitude and polar cap models which are required by Space Division and the Air Weather Service to improve space communication systems, satellite survivability and to develop codes for spacecraft environmental interactions.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: An important long-term research goal is to sufficiently understand solar processes so that the sun's activity is predictable on an operationally useful timescale, thereby enabling predictions of outages, interruptions, changed performance and other effects that solar events have upon

communications, over-the-horizon radar, and other important space-dependent systems. The study of solar active regions with refined statistical techniques and of coronal configurations that produce geomagnetic disturbances and enhanced solar wind will provide improved early warnings for Air Force systems. Long term changes in the solar output will be monitored and will be correlated with changes in the earth's atmosphere. A test of advanced ground-based imaging systems will be made. The solar flare research will be expanded to include the study of solar flare initiated shocks in the near-earth environment which can produce major perturbations of the terrestrial environment where Air Force systems operate. Coordinated studies of specific solar particle events from their origin on the sun to their perturbation of the aerospace environment will be undertaken in an attempt to determine the specific phenomenology controlling these environmental penturbations which impede or degrade the performance of Air Force detection, command and control systems. Spacecraft charging due to its interaction with the particles in the space environment can have a great effect on spacecraft electrical systems. This phenomenon and the highly position-dependent space environment which causes it must be thoroughly understood prior to developing effective designs for future space systems. Simultaneous data from two polar orbiting satellites will be utilized in a cooperative program to produce and improve a global model which interpolates and predicts total electron content, electron density and scale height. Measurements will be made from spacecraft for use in validating spacecraft charging models and for application to large space structures. Data from satellites will be used with a time-dependent magnetospheric model to study the motion of the high latitude ionosphere and the effects of energy input on the ionosphere. Factors will be determined which contribute to the production, evolution and decay of small scale irregularities which produce scintillitations. This phenomonology will contribute to a breakthrough in prediction of high-latitude conditions which severely degrade Air Force high frequency communication systems.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

18. (U) PROJECT 2312 Biological and Medical Sciences (PROJECT UNDER $10M IN FY 1984).

A. (U) Project Description: This program provides fundamental knowledge in biotechnology required in the development and operation of effective manned weapon systems. Toxic materials such as Air Force unique fuels and propellants as well as electromagnetic radiations are studied to assess their potential hazard and to devise corrective measures. Research in physiology and biomechanics provides knowledge for improving personnel protection and performance in varied stress environments encountered during flying. Research in neurobiology is intended to investigate alternative architectures to that of the conventional digital computer, with an emphasis on neurobiologically oriented approaches to machine intelligence.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: (1) Research to find early indicators of latent toxic effects has resulted in the discovery of a significant increase in a biochemical which interferes with the repair of genetic material (DNA) damaged by Air Force chemicals. This biochemical cue indicating that cells may later undergo permanent transformation can be used as a screen for toxic chemicals and should reduce significantly the time and cost required by current protocols for determining latent toxicity of Air Force chemicals. (2) A potentially revolutionary new anticancer compound has been

discovered. Benzamides have been shown to prevent the carcinogenic transformation of human cells exposed to a potent carcinogenic metabolite of hydrazine propellants by permitting DNA repair to proceed as normal. Further research is needed to define the parameters for use of these compounds. (3) Previous research in fundamental mechanisms of nerve cell information transfer showed a two order of magnitude increase in learning ability in a trained cat when a conditioned response was coupled with hypothalamic (an area near the base of the brain) stimulation. During the past year, recordings from single cells in the brain cortex were found to predict which areas in the hypothalamus will enhance learning of the conditioned response. This research will result in the mapping of excitatory and inhibitory areas of the hypothalamus and identify one link in the nerve network responsible for the hypothalamic enhancement of learning. (4) Studies to examine physiological mechanisms underlying circadian (body clock) cycling have resulted in knowledge that body cycles in the squirrel monkey are controlled by two different pacemakers. This is similar to the two oscillator system in the human and indicates that this animal model can be used to further define the circadian system and for identification of anatomical sites of these pacemakers. This research could lead to procedures to alter circadian cycles and to define future strategies to minimize the physical and mental detriment caused by unconventional work-rest cycles.

(2) (U) FY 1983 Program: The research initiative in defense against chemical agents is emphasizing efforts to determine the effects of sublethal doses of nerve agents on the visual system and on the induction of delayed neurotoxicity. New research in toxicology emphasizes the use of novel genetic approaches to determine actual mechanisms of chemical mutagenesis for Air Force chemicals. Toxicant-cell membrane interactions continue to receive emphasis. Electromagnetic radiation bioeffects studies emphasize enzyme effects and the hazard posed by the increasing use of millimeter waves for target acquisition and radar systems. Research in the area of environmental fate and biological effects of Air Force chemicals is receiving less emphasis. The initiative on the biological basis for advanced information processing systems concentrates on the study of control of changes in adaptability and reinforcement in single nerve cells. A new in-house research effort is directed toward understanding the linear and non-linear interactions which occur within the central nervous system and to develop descriptions which will aid in understanding the way multisensory information is prioritized. Studies in aerospace physiology define the basic criteria for therapeutic procedures to prevent jet-lag. In-house research studies are directed toward work to develop techniques to understand human performance as a system controller and to determine means of measuring sustained and divided attention during performance of multiple tasks.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The research initiative in defense against chemical agents maintains emphasis on the visual system, receptor alterations and chemical characterization. While maintaining a strong emphasis in toxicant-cell membrane interactions, toxicology research is directed at mechanisms involved in regulating activation and detoxification systems at the cellular level. Such research should result in novel ways of helping the body defend itself against toxic hazards. This knowledge will extend man's capability to operate in chemically contaminated environments, specifically during chemical warfare. Research in regulation of bioreactivity will begin this fiscal year. Modest funding will be provided to launch this new area which will attempt to significantly increase man's ability to process critical information in high data rate environments typical of command and control scenarios. New efforts in the field of radiofrequency radiation bioeffects will emphasize biophysical interactions with tissues, while efforts to determine the biological effects of millimeter waves will continue. This research is needed to better understand the effects of high power radar equipment on human operators. The neurophysiology initiative will be extended to research into actions of large nerve cell nets, the functions of major nuclei in the brain on information

transfer and the localization of information passing pathways. Knowledge of the means by which nerve cells adapt and communicate will be used in parallel efforts to design adaptive computer components for use in 'smart' avionics instrumentation. This knowledge will provide new adaptive computer architectures to speed the flow of information in increasingly complex command, communication, and control environments. In-house studies of the central nervous system will be expanded to examine cross comparisons of phase information from the cerebellum with that derived from primary sensory cortical receiving areas. This will enhance our understanding of the nervous system's use of short latency inputs to the cerebellum and aid in understanding the way multisensory information is prioritized. This will serve as a foundation to enhance human sensory information processing during control of advanced weapon systems.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

19. (U) PROJECT 2313 Human Resources (PROJECT UNDER $10M IN FY 1984).

A. (U) Project Description: This program provides the knowledge required to insure that Air Force personnel are fully prepared to develop, operate, maintain, and manage current and future weapons systems. Specific objectives include: establishment of an improved manpower and personnel system and definitions of the role of the operator in the design and operation of increasingly complex operator-machine systems. Research is conducted to characterize and predict human capabilities relative to military occupational requirements. Major areas of concentration are: evaluation of basic human abilities; quantitative measures of workload; human operator performance requirements in advanced aerospace systems; studies to advance the use of simulation in flying and technical training; visual processing in simulation training and in system design; and information processing and decision aiding in command and control contexts.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: (1) Research results specify which parameters must be duplicated in simulators for combat flight training to be effective as well as clarify those situations where fidelity of detail inhibits training because it interferes with the trainee's ability to perceive and absorb essential relationships. These findings have important implications for effective and economical simulator design. Related research has determined novel ways to use sophisticated simulators for teaching critical combat skills. (2) Research in new, more accurate visual standards has progressed far enough to be transitioned to exploratory development. Efforts have resulted in the development of simple visual and visual-motor tests which have high predictive power for future flying performance. (3) The basic research program involving novel training procedures for complex pilot skills has been transitioned to exploratory development. Results of such research have been incorporated into the design of more effective, less expensive flight simulators to teach novel training procedures for complex skills. (4) An in-house laboratory computer facility designed to investigate the parameters of learning abilities in enlistees and relate these to the development of more effective and efficient job specific performance prediction is now operational.

(2) (U) FY 1983 Program: The biocybernetics/workload research program is evolving towards a theoretically-based modeling of the unique physiological signatures of component sensory-perceptual, cognitive and response processes. Both

electrophysiological and neuromagnetic methods of mapping their neurophysiological substrates are being employed. The in-house learning abilities laboratory is investigating the possibility of using dynamic rather than static learning tests as job-specific performance predictors. The vision programs are focussed on the development of a comprehensive integrated quantitative model of visual information processing. Efforts are being directed towards (1) development of a unitary measure to describe human and non-human parameters of target acquisition, (2) description of the nature and limitations of brain mechanism responsible for perception of form, depth, and motion, (3) specification of voluntary eye movement patterns which achieved optimal visual processing of complex, dynamic patterns of information, (4) discovery of the constraints and facilitation involved in coupling auditory processing with visual processing in the coding of essential information by the human operator, and (5) comparison of traditional behavioral measures of visual processing with gross physiological measures. Efforts designed to use biological models of visual processing to develop man-mode image processors have been interrelated with electronics and mathematical basic research to make up a new initiative in image understanding.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The research program in biocybernetics/workload will continue codifying the elemental building blocks of human information processing activities both spatially and temporally. A neurophsychological test battery is aimed at differentially indexing human information processing activities that are representative of operational tasks. The in-house learning abilities laboratory will be expanded to allow investigation of multiplayer skill development and performance. Studies will continue to systematically describe parameters of learning retention and reacquisition of essential skills for Air Force enlistees. The extramural vision program will be redirected to consider information processing through other human senses, particularly hearing. In-house studies of human visual processing will continue to extrapolate results from controlled laboratory environments to the complex, dynamic environments required for operational effectiveness. The knowledge obtained from these research programs will improve the methods of assessment and prediction of human abilities for better selection and training, and for enhanced design of manned weapons systems; specify the characteristics and constraints on displayed information to achieve optimal operator performance; and provide mathematical models of human vision and suggest biological models to be incorporated into image processing and robotic systems.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

20. (U) PROJECT 2917 University Research Instrumentation (PROJECT IS $10M IN FY 1984).

A. (U) Project Description: An Interagency Working Group on University Research Instrumentation concluded that the deterioration of research facilities at universities in the United States has reached a crisis stage. In order to restore the university research base in areas supporting DoD objectives, the Office of the Secretary of Defense has directed that each Service increase its research budget request by $10 million starting in FY 1983. For comparison, the Air Force research program normally provides $2 to 5 million per year for research equipment. The Air Force plans to fund equipment purchases associated with scientific research directed to the advancement of military aerospace technology and this project has been initiated to manage the resources.

Program Element: #61102F
DoD Mission Area: #510 Defense Research

Title: Defense Research Sciences
Budget Activity: #1 Technology Base

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: None. New start in FY 1983.

(2) (U) FY 1983 Program: The program was advertised in the summer of 1982. All equipment proposals are being submitted to the Office of Naval Research as the central point for administrative control. The Air Force Office of Scientific Research is administering the Air Force portion of this program by selecting research equipment proposals for funding based upon the significance to the Air Force and scientific merit of the related research, competence of the research personnel, reasonableness of the proposal cost, and value to the Air Force of the increased research capability resulting from the proposed research equipment purchases.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Present guidance from the Office of the Secretary of Defense is to continue this project at the funding level of $10 million in FY 1984.

(4) (U) Program to Completion: Present guidance is to continue this project at the funding level of $10 million per year for FY 1985 through FY 1987.

C. (U) Major Milestones: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #62101F | Title: Geophysics
DOD Mission Area: #522 - Environmental and Life Sciences | Budget Activity: #1 - Technology Base

I. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number		Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
		TOTAL FOR PROGRAM ELEMENT	34,162	37,765	40,637	41,723	Continuing	N/A
06GL		Laboratory Operations	18,685	19,521*	19,755	20,064		
4643	**	Ionospheric Specification	2,009	2,200	2,500	2,500		
6670		Meteorological Development	1,445	1,644	1,700	1,700		
6687		Middle Atmosphere Effects	805	900	1,000	1,059		
6690		Upper Atmosphere Technology	1,640	1,800	1,900	1,900		
7600		Terrestrial Geophysics	600	850	900	900		
7601		Magnetospheric Effects on Space Systems	1,135	1,630	2,282	2,500		
7659		Aerospace Probe Technology	697	800	800	800		
7661		Spacecraft Environment Technology	1,810	2,220	3,000	3,400		
7670		Optical/IR Properties of the Environment	5,336	6,200	6,800	6,900		

* Excludes 1 Oct 82 Civilian Pay Raise
** Project Title Change From Aerospace Radio Propagation.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The geophysical environment has the capacity to alter the performance of Air Force systems and operations; it seldom acts to enhance the performance of a system. Prime examples of functions significantly affected by geophysical conditions, and which can be nullified completely by them, are missile guidance, air launch and recovery, space vehicle tracking, satellite surveillance and communications. The technology developed in this program element enables Air Force system planners, designers and operational commands to mitigate the effects of the geophysical environment, and, in selected cases, to exploit them. This program also provides for the operation and management of the Air Force Geophysics Laboratory, Hanscom AFB MA.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

33,485	37,780	39,195	Continuing	N/A

The FY 1984 funding increase reflects emphasis in the areas of space radiation, earthlimb backgrounds and space environment.

Program Element: #62101F
DOD Mission Area: #522 - Environmental and Life Sciences

Title: Geophysics
Budget Activity: #1 - Technology Base

4. (U) OTHER APPROPRIATION FUNDS:

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Military Construction, Funds	0	0	2,250	0	0	2,250

5. (U) RELATED ACTIVITIES: This program greatly benefits from research performed in Program Element (PE) 61102F, Defense Research Sciences. Major beneficiaries of the technology developed in this program are PE 63410F, Space Systems Environmental Interactions Technology; PE 63424F, Missile Surveillance Technology; PE 63428F, Space Surveillance Technology; PE 63438F, Satellite Systems Survivability; PE 63707F, Weather Systems (Advanced Development); and PE 63403F, Continental United States Over-The-Horizon Backscatter Radar System; PE 64707 Weather Systems (Engineering Development). Programs in the broad area of geophysics are conducted by the Army and Navy and other non-military federal agencies such as the National Oceanic and Atmospheric Administration and National Aeronautics and Space Administration. When applicable to Air Force requirements, information gathered by others is used in the Air Force program. In addition to such complementary programs, joint or coordinated programs are conducted with other agencies when mutual interests exist. The work within this program element is coordinated (1) at the annual tri-service briefings to the Office of the Undersecretary of Defense for Research and Engineering during apportionment review, (2) through the National Aeronautics and Space Administration/Air Force Space Research and Technology Interdependence Working Group which meets semiannually, (3) with National Oceanic and Atmospheric Administration and other federal agencies engaged in geophysical sciences through committees of the Federal Coordinating Council for Science, Engineering, and Technology and the Federal Coordinator for Meteorological Services and Supporting Research, and (4) through working groups set up by Air Force Geophysics Laboratory such as in satellite meteorology. Examples of joint or coordinated programs are: Joint Doppler Operational Program, a program with the National Oceanic and Atmospheric Administration to develop techniques for using Doppler radar for reliable severe storm detection; Spacecraft Charging and Spacecraft Environment Interactions, joint programs with the National Aeronautics and Space Administration to determine causes and means of controlling undesired electrical charge buildups on satellites, and to develop environmental specifications for future large space structures; Atmospheric Transmission, a coordinated program with the Army and Navy to develop the capability and the computer codes to predict and overcome the obscuring effect of the atmosphere on visual, infrared and millimeter wave sensors employed in tactical and strategic systems; Intercontinental Ballistic Missile Accuracy, a coordinated program with the Defense Mapping Agency to develop techniques and geophysical instrumentation to improve intercontinental ballistic missile targeting accuracy; and Nuclear Weapons Effects, a program with the Defense Nuclear Agency to model the nuclear-disturbed environment.

Program Element: #62101F
DOD Mission Area: #522 - Environmental and Life Sciences

Title: Geophysics
Budget Activity: #1 - Technology Base

6. (U) WORK PERFORMED BY: Work performed under this line item is conducted and managed by Air Force Geophysics Laboratory, Hanscom AFB, MA. Off-base field sites are: Weather Radar Site, Maynard, MA; Weather Test Facility, Otis AFB, MA; Goose Bay Ionospheric Observatory, Goose Bay, Labrador; and Balloon Launch Detachment, Holloman AFB, NM. There were approximately 80 contractors doing work under 147 contracts utilizing FY 1982 62101F funds. Five of the major contractors were: Utah State University, Logan, UT; Boston College, Newton, MA; Space Vector corp., Northridge, CA; Wentworth Institute, Boston, MA; Visidyne, Inc., Burlington, MA.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 4643 - Ionospheric Specification. Understand and predict the effects of atmospheric ionization on Air Force communication, surveillance, and navigation systems that involve radio wave propagation. In FY 1982, the Air Force Geophysics Laboratory Airborne Ionospheric Observatory conducted measurements in the polar cap region in coordination with the Air Force Satellite Communication System and other available satellites. The laboratory demonstrated that there are sub-visual auroras in the F-region of the ionosphere. Their drift, ionization and resulting irregularities are now recognized to be of sufficient intensity to affect Air Force communications systems operating in the polar region. Participated in the Brazil Ionospheric Modification Experiment, which resulted in the temporary modification of the F-region Ionosphere. During FY 1983, the laboratory will evaluate the Brazil Ionospheric Modification Experiment data for its utility in creating and quenching radio scintillation effects in operational scenarios. They will also participate with the Defense Nuclear Agency in a joint study of the high latitude ionospheric irregularities and radio scintillations by instrumenting a polar-orbiting satellite. In FY 1984, emphasis will be placed on the physical modeling of the relationships between the high latitude scintillation, which is of direct concern to designers and users of Air Force communication, detection and navigation systems, and the driving mechanisms which produce, and order the location and movement of irregularity regions.

B. Project: 6670 - Meteorological Development. Develop better methods of observing, processing, displaying, analyzing and forecasting meteorological elements. In FY 1982 this project completed development and transferred to the Next Generation Weather Radar Program Office for inclusion in its software an improved automated hail detection technique using Doppler weather radar data. This technique provides significant improvement in hail detection with a six-fold reduction in the false alarm rate. During FY 1983 efforts will continue to exploit doppler weather techniques for detection of severe storm precursors to improve warning time performance of the Next Generation Weather Radar. In addition, remote broadband radiometry along with in-situ measurements will be evaluated for feasibility in measuring cloud cover, tops and bases. In FY 1984, evaluation of techniques for automatically incorporating satellite weather data into numerical weather prediction models will begin.

C. Project: 6687 - Middle Atmosphere Effects. Define the effects of stratospheric ions aerosols, and turbulence on Air Force systems. In FY 1982, the first successful measurements of stratospheric ions were made. Large concentrations of positive ions with several hundred mass units were observed. These measurements will be used in determining the attenuation of low frequency radio waves in disturbed conditions such as nuclear explosion. During FY 1983 this stratospheric ion measurements program will continue. In addition the comparison of thermosonde, lidar and scintillometer techniques will be continued in order to measure optical turbulence which constrains the performance of communication, surveillance and guidance systems using lasers. In FY 1984, models of stratospheric ion and aerosol composition will be developed for use in designing AF systems which propagate radio frequency and optical signals in the stratosphere.

D. Project: 6690 - Upper Atmosphere Technology. Determine the structure and properties of the neutral and ionized atmosphere and to develop atmospheric models which are used to provide specifications for the design and operation of Air Force systems. In FY 1982 an improved atmospheric density model which computes satellite orbits more efficiently and with greater accuracy was provided to the Air Defense Command. A one spectrometer preliminary version of the horizon ultraviolet sensor was successfully flown. During FY 1983 this horizon ultraviolet data will be analyzed and the results used to provide initial earth limb profile data in the 100-200 nanometer region. A complete six spectrometer unit covering the 100 to 400 nanometer region will be tested and delivered for a spaceflight in FY 1984. Also in FY 1984, a ground based light detection and ranging instrument will be tested at Kwajalein Missile Range to determine the atmospheric density along the reentry corridor of missiles launch from Vandenberg AFB CA. Data obtained during these tests will be used to improve reentry prediction calculations.

E. Project: 7600 - Terrestrial Geophysics. Determine the effects of the size, shape, mass distribution and motion of the earth on missile operations. In FY 1982, improved inertial navigation and guidance systems performance by developing a technique which uses satellite altimetry measurements to reduce the uncertainty in the mean sea level model and the resulting gravity field. During FY 1983 direct measurements of gravity at altitudes up to 50 kilometers will be made for the first time to test and verify predictions of the vertical dependence of gravity and its effect on missile guidance. In addition, an intensive field program will be conducted to demonstrate the performance of miniature interferometer terminals for earth surveying, using Global Positioning Satellite signals in reducing the survey time of multiple missile bases, with twice the present precision. In FY 1984, the testing of the miniature interferometer terminals for earth surveying will be extended to determine baselines of thousands of miles in length to meet geodetic requirements for improved missile targeting accuracy.

F. Project: 7601 - Magnetospheric Effects on Space Systems. Develop techniques for monitoring the Global activity level of the magnetosphere and provide Space Division and Air Weather Service with model, design and prediction tools for future system designers. In FY 1982, the laboratory delivered to Space Division and the Air Weather Service a fully tested code which represents an important new tool for improving communications links in the polar regions. The code requires only that users specify magnetic local time and the magnetic activity level to locate the equatorward edge of the auroral oval, which defines the latitude where significant degradation of communications begins due to auroral precipitation. The code also aids in selecting optimum sites for high latitude radars. During FY 1983 the instrument design phase of a space radiation experiment will be initiated. This experiment is currently planned for an FY 1986 launch. It will measure the radiation hazards of the space environment and the performance in orbit of shielded and unshielded, high performance microelectronics in hardened and unhardened versions that will be required for future space systems. In FY 1984, an evaluation of computer and laboratory plasma techniques that will define the critical parameters for modifying the space plasma environment will be conducted.

G. Project: 7659 - Aerospace Probe Technology. Develop techniques and equipment for instrumentation and launch of balloons and rockets in order to obtain in-situ measurements of environmental parameters which critically affect the design and operation of Air Force surveillance, communication, reconnaissance and weapon systems. In FY 1982, completed the development of a commandable, two-axis point control for tethered balloon payloads for use in obtaining optical transmission measurements. This development provides a capability to attack the slant range visibility problem. During FY 1983, the evaluation of a radar carrying tethered balloon system as a viable option for operations in the extreme arctic environment will be completed. In FY 1984, a flight test of an airborne, adaptive, programmable, data handling system will be conducted. This system will only require reprogramming for data handling applications.

H. Project: 7661 - Spacecraft Environment Technology. Define the polar earth orbit electron and ion population, develop a computer code to simulate the interaction between the polar space environment and the shuttle/advanced systems, investigate charge beam release space interaction with host vehicle and the ambient environment and develop a prototype spacecraft discharge system. In FY 1982, a physical model of the interactions between the shuttle and earths polar environment was developed. This model provided the basis for a preliminary version of the Potentials of an Orbiting Large Spacecraft in the Auroral Region Code which will be developed into a computer aided design tool under PE 63410F, Space Systems Environmental Interactions Technology; for application to Space Radar, Shuttle flight payloads and astronaut Extra Vehicular Activity. During FY 1983, this physical model will be extended to include the effects of magnetic and electric fields on the density of ions surrounding the spacecraft. In FY 1984, a sounding rocket instrumented to study the effects of charged particle beam ejection on the rocket vehicle, the charged particle itself and the surrounding ambient environment will be launched.

I. Project: 7670 - Optical/Infrared Properties of the Environment. Measure and model the infrared and optical properties of the atmosphere through which optical/infrared radiation from targets, guidance systems and communication systems must penetrate, and the backgrounds against which targets must be detected and tracked. In FY 1982, the fifth edition of the standard Department of Defense low resolution atmospheric transmission code was modified and extended by including a maritime aerosol model, a low visibility battlefield model, a cirrus cloud model, and a rain model. These modifications aid code users in producing atmospheric transmission predictions for operationally realistic conditions. One important application of this code is its use in developing practical tactical decision aids for field Commanders who need to determine quickly which type of guided munitions to order uploaded and how to apply them. During FY 1983, two rocket probes will be launched into the winter time auroral zone. The first will be an earth limb infrared atmospheric structure probe to determine the spatial structure of short wavelength infrared background radiance. The second probe will be a cryogenic field-widened interferometer that will obtain data on the spectral composition of the short wavelength infrared atmospheric background radiation and thereby make it possible to identify the infrared radiating species produced under wintertime auroral excitation. The data from these two rocket probes will help surveillance systems designers to overcome the interference produced by enhanced levels of background radiation in disturbed atmospheres. In FY 1984, a long wavelength infrared earthlimb clutter probe will be launched to determine the diurnal variation of atmospheric clutter radiance. In addition, a celestial measurement probe will be flown to complete the coverage required for the Air Force Geophysics Laboratory sky catalog at its present sensitivity level.

8. (U) PROJECT: 06GL - LABORATORY OPERATIONS (PROJECT OVER $10 MILLION IN FY 1984):

A. (U) Project Description: This project provides for operation of the Air Force Geophysics Laboratory, Hanscom AFB MA, including pay and related costs of civilian scientists, and support personnel, travel, transportation, rents, communications, and utilities costs, procurement of supplies, equipment and contractor support services. The Air Force Geophysics Laboratory performs research, and exploratory development in the geophysical sciences, i.e., geodesy, geokinetics, meteorology, optical physics, ionospheric physics, upper atmosphere physics, and space physics in support of immediate or potential needs of air Force operational systems.

B. (U) Program Accomplishments and Future Efforts: Not applicable.

C. (U) Major Mileatones: Not applicable.

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FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #62102F
DOD Mission Area: #523 - Engineering Technology (ED)

Title: Materials
Budget Activity: #1 - Technology Base

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	42,150	46,164	47,644	53,276	Continuing	N/A
06ML	Laboratory Operations	14,728	17,354*	17,679	17,970		
2417	Thermal Protection Materials	3,385	3,746	3,884	4,171		
2418	Metallic Structural Materials	5,480	5,352	5,678	7,251		
2419	Nonmetallic Structural Materials	4,807	4,712	4,919	6,552		
2420	Aerospace Propulsion Materials	3,462	3,952	3,956	4,272		
2421	Fluid, Lubricants and Fluid Containment Materials	3,365	3,548	3,584	3,770		
2422	Protective Coatings and Materials	3,173	3,447	3,684	4,344		
2423	Electromagnetic Windows and Electronic Materials	3,750	4,053	4,260	4,946		

*Excludes 1 Oct 82 civilian pay raise.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element conducts the entire Air Force exploratory development program in materials. It develops new and improved materials which are required to meet the increased performance, reliability and survivability demands of current and future aerospace systems. The needs of Air Force aircraft, spacecraft and missiles are specialized and unique and cannot be satisfied solely by civilian research and development programs. The program also provides management and operational support for the Materials Laboratory, Wright-Patterson Air Force Base, OH, as the Air Force agency concerned with all aspects of materials research, development and manufacturing technology.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	42,156	46,174	49,866		Continuing	N/A

Difference in FY 1984 due primarily to reduction in Project 2418, Metallic Structural Materials and Project 2419, Nonmetallic Structural Materials.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

Military Construction 20,600

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Program Element: #62102F Title: Materials
DOD Mission Area: #523 - Engineering Technology (ED) Budget Activity: #1 - Technology Base

5. (U) RELATED ACTIVITIES: All three military services, the Defense Advanced Research Projects Agency, the National Aeronautics and Space Administration, the Department of Energy, and industry through the Independent Research and Development program, carry out research and development programs in materials technology specifically related to their requirements. Coordination is provided by the exchange of planning documents, joint agency technical planning committees, and activities such as the Department of Defense Metal-Matrix Composite Steering Committee, the Materials Development Coordination Committee for Advanced Strategic Reentry Vehicles, the Department of Defense Materials and Structures Technology Conference, and the Tri-Service Laser Hardened Materials and Structures Group. These joint planning meetings and materials coordination activities highlight the specialized materials requirements of each organization and are determining factors in the formulation of complementary, nonredundant materials research and development programs. Interface with industry and the technical community is reinforced by active participation in academic and professional organizations and societies. This program element receives specific input from PE 61102F, Defense Research Sciences, and provides technical output to other program elements such as PE 63211F, Aerospace Structures and Materials, and PE 78011F, Manufacturing Technology.

6. WORK PERFORMED BY: The Materials Laboratory of the Air Force Wright Aeronautical Laboratories, Wright-Patterson Air Force Base, OH, is the organization responsible for the management of this program. The top five contractors in FY 1982 were: University of Dayton, Dayton, OH; United Technology Corp, Longueuil, Quebec, CN; Ames Research Center, Moffett Field, CA; Systems Research Laboratories, Dayton, OH; and ITT Research Institute, Chicago, IL. There are 93 additional contractors with a FY 1984 total dollar value of $23,882,000.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 2417, Thermal Protection Materials. Provides materials and processes for thermal protection of systems and components subject to severe thermal stress and erosive environments. The effects of thermal erosion and high speed particles on reentry body and rocket motor performance and survivability require that this project emphasize materials technology for strategic offensive systems. In FY 1982 the carbon/carbon (C/C) composite technology developed for erosion resistant reentry vehicle nosetips was applied to rocket motors and has been selected as the nozzle material for all stages of the Air Force MX missile. A computerized C/C data bank was established for use by industrial designers. A totally integrated nondestructive evaluation (INDE) technique was developed and demonstrated for thin and thick wall C/C components. New composite materials with major improvements in shear strength and bend stiffness were developed for advanced reentry vehicles. Polyacrylonitrile (PAN) tape wrapped carbon fabric/phenolic heatshields were developed in FY 1982 but improvements in purity and interlaminar shear strength are required. Efforts were initiated in FY 1982 to fabricate oxidation resistant carbon/carbon for combustor sections of cruise missile engines. FY 1983 goals are to: validate advanced construction carbon/carbon nosetip materials in simulated missile reentry/weather environments and develop a 3-D pierced fabric carbon/carbon composite exit cone for solid propellant rocket nozzles. FY 1984 goals are to: develop penetration aid materials for advanced reentry vehicles and develop PAN-based graphite yarns with highly crenulated surfaces for high shear carbon/carbon structural applications.

Program Element: #62102F
DOD Mission Area: #523 - Engineering Technology (ED)

Title: Materials
Budget Activity: #1 - Technology Base

B. Project: 2418, Metallic Structural Materials. Provides reliable metallic materials and processes with optimum combinations of properties from cryogenic temperature to 1,200°F for use in aerospace structural applications. Provides the development and feasibility demonstration of the advanced technologies required to increase productivity for future Air Force manufacturing and maintenance processes. FY 1982 accomplishments included reducing maintenance costs of aerospace systems through application of improved corrosion prediction and control techniques, repair technique replacement with improved materials and vibration damping technology. Nondestructive inspection technology improvements have been integrated into inspection equipment and techniques for field inspection of composites, bonded structures, and a variety of metal structures in critical aircraft and propulsion systems. The development of vastly improved aluminum alloys with higher modulus, lower density, higher strength, and useful properties to temperatures as high as 650°F was advanced very successfully and is part of a DOD identified thrust in rapid solidification technology (RST). FY 1983 goals are to: demonstrate a lithium-aluminum alloy with a 6% density reduction as compared to conventional aluminum alloys; demonstrate the production of RST powder titanium; develop new procedures for establishing inspection reliability goals for new weapon systems designs; and demonstrate analytical modeling of the forging process. FY 1984 goals are to: develop advanced, high reliability NDE techniques and instrumentation for the detection and characterization of critical defects in radar absorbing structures; provide quick reaction materials and processes (M&P) support to Air Force Systems Command Product Divisions, Air Force Logistics Command and Operational Commands, and transition improved materials and processes to systems use; continue broad based M&P support to AF systems, establish in-house composites supportability capability, continue transition of new materials such as 7050 aluminum alloy and powder aluminum alloys; enhance the capability of analytical and computer support to the Laboratory research and development program; and apply integrated computer aided manufacturing systems to the major functions of manufacturing to increase productivity and flexibility of manufacturing.

C. Project: 2419, Nonmetallic Structural Materials. Develops new and improved nonmetallic materials with optimum combinations of properties from cryogenic temperature to 1,200°F to provide weight savings in aerospace structural applications. FY 1982 accomplishments included development of high vinyl modified epoxy matrix materials and low cost synthesis approaches for making acteylene terminated (AT) polymers. The methodology to monitor the composition of epoxy matrix materials has been established and these methods are being employed by aerospace contractors in purchasing materials as part of their quality assurance program. Initial activity has been undertaken to establish the structure/property relationships between the matrix material chemistry and its dynamic behavior, leading to better control of the composite manufacturing process. Ordered polymer fibers with substantial increases in both stiffness and modulus were developed in FY 1982. Radar absorbing material concepts which employ advanced composites demonstrated equivalent electrical properties to current absorber concepts with reductions in thickness and vastly improved structural efficiency. Cumulative damage modeling for predicting composite failure was initiated in FY 1982. A local model for interlaminar stress analysis in thick composite sections was developed. The relation of metal/metal oxide/adhesive resin interphase to the structural performance of bonded joints has been characterized. The feasibility of fractographic analysis to deduce load/stress history of adhesive bonded joints has been shown. FY 1983 goals are to: complete development of composite processing methodology based on use of liquid resin pressure transducers; establish an optimized process for the formulation of paraphenylene bisbenzothiazole (PBT) films; and establish feasibility of a ternary alloy magnetic materials absorber. FY 1984 goals are to: develop improved, failure resistant, structural composite materials by developing an understanding of processing-property relationships and develop advanced structural materials/absorber concepts employing composites technology which significantly reduce the weight penalties of Radar Absorbing Materials/Radar Absorbing Structures.

D. Project: 2420, Aerospace Propulsion Materials. Provides improved materials and/or processes for application to current and future aircraft, missile and air breathing engine propulsion systems to improve productivity, reduce life cycle costs and increase performance. In FY 1982 titanium aluminides successfully progressed through manufacturing trials and are being evaluated in other programs. Rapid solidification technology processing of iron aluminides was successfully demonstrated, and carbon/carbon composites were analytically shown to have significant potential in weight reduction and higher temperature capability in turbine engines. New ceramic matrix composite concepts were developed and evaluated. The turbine engine materials life prediction technology was exploited and applied in a large, aggressive retirement for cause demonstration-validation program using the F-100 engine as its vehicle. Progress has been significant and the potential savings in maintenance costs identified are very substantial. FY 1983 goals are to: develop constitutive models for high temperature behavior and refined modeling techniques for small crack growth; develop an advanced overlay coating for single crystal blades and vanes and an improved temperature thermal barrier coating; complete engine testing of Titanium Aluminide static components and preliminary screening of Iron Aluminide alloys. FY 1984 goals are to: develop improved coating systems for advanced nickel-based superalloy blades and vanes to extend the life of these components and develop advanced RST materials with greater strength, and durability and with lower strategic materials content than current alloys.

E. Project: 2421, Fluids, Lubricants, and Elastomeric Materials. Provides materials and supporting technology for lubricants, energy transfer fluids, fluid containment and sealing. In the area of lubrication, materials are developed for liquid, semisolid, and solid lubricants for aircraft, spacecraft, and cruise missiles along with an understanding and prediction of their performance. Fluid containment and sealing efforts provide fuel tank sealants, fluid system seals, and expulsion diaphragms. In FY 1982 a low viscosity chlorotrifluoroethylene based nonflammable hydraulic fluid, formulated to achieve weight savings, successfully completed a 100 hour pump test with no loss of fluid viscosity. Initial synthetic approaches to candidate synthetic hydrocarbons and silahydrocarbons were developed. Analytical techniques to evaluate lubricant performance in a space environment were refined. Anti-oxidant and synthetic hydrocarbon based greases were developed. Special techniques for grease lubrication of porous retainers were developed. Phosphonitrilic fluoroelastomer (PNF) seals have been developed for use with chlorotrifluorethylene fluid over a temperature range of -65°F to 270°F in aircraft nonflammable hydraulic systems. Flight testing of in-house developed gap tolerant integral fuel tank channel sealants has been initiated in five F-4 aircraft at Eglin AFB. Chalking rate studies on polysulfide fuel tank sealants were completed and indicated that chalking should not cause fuel leaks during the 15 year life of the F-16 aircraft. FY 1983 goals are to: evaluate hydraulic fluid and sealing system technology for a -65° to +275°F, 3,000 psi braking system and develop a 10,000 psi hydraulic pump test stand; transition corrosion inhibited engine oil to the Air Force Wright Aeronautical Laboratories Propulsion Laboratory for qualification and preliminary evaluation of 600°F gas turbine oil seals; and correlate actual bearing performance with that predicted by computer models. FY 1984 goals are to: develop (-65° to +275°F) nonflammable hydraulic system fluids and seals for high pressure (8,000 psi) aircraft braking systems; establish baseline sealing technology for graphite/epoxy and graphite/polyimide composite fuel tanks; develop accelerated life

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prediction techniques for lubricated moving mechanical assemblies for satellites; and demonstrate a shear stable viscosity index improver for synthetic hydrocarbon fluids.

F. Project: 2422, Protective Coatings and Materials. Provides materials and concepts to enhance the survivability of aircrews and vital components of Air Force systems in natural and induced hostile environments. Although related to the materials needs discussed in other projects, materials considered in this project primarily have a protective function that is essential to the survival of the crew, structure, avionics, and other critical subsystems of the military systems. In FY 1982, waterborne films technology was transferred to industry for future development of high performance aircraft coatings. Cavitating liquid jets and strippable primers were investigated for environmentally acceptable, cost effective coating removal. Spacecraft Charging at High Altitude (SCATHA) space flight experiment has completed two years in orbit and additional data on spacecraft charging/contamination was obtained and analyzed. New efforts in developing acceptance criteria for low contaminating materials, developing low outgassing potting compounds, and characterizing conformal coatings performance limits have been initiated. Experiments on a concept for protecting an optical system against laser threats across a broad band of wavelengths were started; a low energy pulsed laser hardening concept was identified and potentially viable defenses against the high energy pulsed laser threat were identified. FY 1983 goals are to: complete industry survey of available contamination characterization techniques; investigate aircraft paint stripping techniques including high pressure water and lasers; and evaluate fixed rejection filters of the rugate design. FY 1984 goals are to: develop low contaminating and thermal control materials for satellites, determine failure mechanisms of potting compounds used in satellite power supplies, and develop concepts and materials for laser hardening of Air Force strategic and tactical optical systems.

G. Project: 2423, Electromagnetic Windows and Electronic Materials. Provides materials and manufacturing processes for optical, electromagnetic, and electronic subsystems. These materials are required for application to a broad range of electromagnetic and electronic devices and components critical to system operation and/or survival in natural and induced hostile environments. In FY 1982 large, uniform, 90 silicon-10 germanium alloy single crystals for improved 1.06 micron detectors were grown for the first time. Hot pressed spinel infrared domes with excellent transmission from the ultraviolet to mid-infrared wavelengths were developed. Designs for durable antireflection coatings for zinc sulfide PAVE TACK windows were developed. Development of 3-D boron nitride/boron nitride antenna window composites for maneuvering RVs has been completed. A program to develop Mercury Cadmium Telluride (HgCdTe)/ Silicon Charge Coupled Device (Si CCD) photovoltaic arrays for strategic surveillance systems has been initiated and is scheduled for transition to manufac turing scale-up. At the same time, a program has been initiated to develop silicon/germanium alloy detector materials that, in principle, could be operated at the same high temperature as HgCdTe while still retaining the advantages of a silicon substrate material. Excellent progress has been made to develop large calcium fluoride laser windows to a diameter of 45 centimeters. FY 1983 goals are to: demonstrate feasibility of Liquid Epitaxial Crystal (LEC) growth of 2 inch Cadmium Telluride (CdTe) substrates for epitaxial HgCdTe and growth of high purity, boron doped silicon; eliminate strain-induced defects in epitaxially grown Silicon (Si) and grow low defect density Gallium Arsenide (GaAs) substrates; and evaluate colorless Zinc Selenide (ZnS) for Forward Looking Infrared (FLIR) and High Energy Laser (HEL) windows and fiber reinforced silicon nitride as antenna windows. FY 1984 goals are to: optimize detector materials for performance in the far-infrared band for strategic applications and develop high reflectance mirrors for HEL systems and antenna windows for advanced reentry vehicles.

Program Element: #62102F
DOD Mission Area: #523 - Engineering Technology (ED)

Title: Materials
Budget Activity: #1 - Technology Base

8. (U) PROJECT: 06DS, Materials Laboratory Operations (PROJECT OVER $10 MILLION IN FY 1984):

A. (U) Project Description: This project provides for the support activities required to operate the Materials Laboratory and includes the pay and related costs of civilian scientists, engineers and supporting personnel, travel, transportation, rents, communications, and utilities cost, procurement of supplies and equipment, and contractor support services. The Materials Laboratory is responsible for the Air Force exploratory and advanced development programs in the area of materials technology, a portion of the basic research program in materials, and for administrative support of the Air Force Manufacturing Technology program. The laboratory provides technical support to current and future system program offices, the Air Force Logistics Command, and the operational commands. It also maintains a quick reaction capability to respond to operational problems involving technology, materials application, and failure analysis.

B. (U) Program Accomplishments and Future Efforts: Not applicable.

C. (U) Major Milestones: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #62201F — Title: Aerospace Flight Dynamics
DOD Mission Area: #523 - Engineering Technology (ED) — Budget Activity: #1 - Technology Base

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	56,465	61,203	61,192	65,825	Continuing	N/A
06FF	Laboratory Operations	31,917	32,243*	32,794	33,268		
2401	Structures and Dynamics	5,930	7,420	7,353	8,783		
2402	Vehicle Equipment	4,631	5,530	5,107	5,889		
2403	Flight Control	6,303	7,210	6,769	7,802		
2404	Aeromechanics	7,684	8,800	9,169	10,083		

*Excludes 1 Oct 82 civilian pay raise.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This exploratory development program provides the flight vehicle technologies required for the design and development of future aerospace vehicles (aircraft, missiles, and spacecraft) and for the improvement of current vehicles. It encompasses the technical areas of structures, aerodynamics, aerothermodynamics, flight performance analysis, vehicle dynamics, flight control, crew station design, crew escape and recovery, environmental control, mechanical subsystems, survivability/vulnerability, and technology integration. The program also provides for the operational support and management of the Flight Dynamics Laboratory, Air Force Wright Aeronautical Laboratories, Wright-Patterson Air Force Base, OH.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	Additional to Completion	Total Estimated Costs
RDT&E	55,155	61,219	65,184	Continuing	N/A

A. The difference in funding between the FY 1984 and the FY 1983 Congressional Descriptive Summaries:

(U) FY 1984: Reduced funding ($3.992M) is a result of undistributed Congressional reductions. In Project 2401, the reduction will curtail intended improvements to: (1) in-house capabilities for structural and dynamic analyses, design and testing, (2) the rapid solidification (powder) technology for advanced structures, and (3) the advanced control techniques for large space structures. Structural testing methods for hypersonic aircraft will not be developed Project 2402 - Reduced funding will curtail: (1) the analysis and conceptual design of a lightweight, cost effective encapsulated emergency crew escape system for single seat high performance aircraft, (2) the development of a light weight variable thickness transparent crew enclosure concept for defeating birdstrikes, and (3) the feasibility study of thermal control/management concepts for large, flexible, distributed array space systems. Project 2403 - Reduced funding will: (1) curtail the large space structure pointing and shape control effort, (2) delay the capability to stabilize and use large antenna structures now under development, and (3) delay the flight demonstration of an electro-mechanical primary actuator. Project 2404 - Reduced funding will: (1) curtail development of a Radar Cross

Section (RCS) prediction methodology, which is simple and economical enough for use in conceptual design, and (2) delay the development of ground plane modeling techniques for simulation of STOL aircraft at various approach heights and speeds and during ground roll.

4. (U) OTHER APPROPRIATION FUNDS: Not applicable.

5. (U) RELATED ACTIVITIES: This program receives technology inputs from In-house Laboratory Independent Research (PE 61101F), Defense Research Sciences (PE 61102F), and Materials (PE 62102F), as well as from other national and international research and development activities. In turn, the technology product of this program is applied to Flight Vehicle Technology (PE 63205F), Aerospace Structures and Materials (PE 63211F), Aircraft Nonnuclear Survivability (PE 63244F), Advanced Fighter Technology Integration (PE 63245F), and other advanced development, and engineering development and system development programs. Cooperative and jointly funded projects are conducted with other Air Force laboratories and organizations, the Army, the Navy, the National Aeronautics and Space Administration, and foreign countries. Coordination and avoidance of duplication of effort is accomplished with these agencies, academic institutions, and industry through exchange of information, coordinating and advisory groups, technical reviews and seminars, professional societies and meetings, and through the preparation of formal Department of Defense documents such as Technical Area Descriptions and Technical Reports.

6. (U) WORK PERFORMED BY: Work is performed in-house by the Flight Dynamics Laboratory, Air Force Wright Aeronautical Laboratories, Wright-Patterson Air Force Base, OH and through contracts managed by that Laboratory. The Laboratory makes use of in-house facilities and other Air Force, government, and industry facilities. The top five contractors are Rockwell International, Los Angeles, CA; The Boeing Company, Wichita, KS; General Dynamics, Ft. Worth, TX; Systems Control Inc., Palo Alto, CA; and McDonnell Douglas, St. Louis, MO. The total number of additional contractors is 58, with a total contract value of $28.5M.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: 2401, Structures and Dynamics. The purpose of this project is to develop and demonstrate structural mechanics and vehicle dynamics technology for flight vehicles which will result in low cost, low weight, high performance structures with assured design life. It has four major goals: (1) effectively applying advanced materials to aerospace vehicles, (2) generating new basic structural dynamics criteria, techniques and concepts to facilitate design and development of weapon systems, (3) maintaining the technical capability and unique facilities needed to attain the preceding goals, and (4) providing the technical expertise required for structures and structural dynamics technical support to other organizations.

(1) (U) FY 1982 Program: Transonic unsteady aerodynamic flutter prediction methods were developed and evaluated by comparison with corresponding experimental data. These methods will reduce the risk of transonic flutter in new weapons systems. Structural design techniques were developed for composite material structures. The techniques consider fatigue life and damage tolerance requirements, as well as response to static, mechanical, aerodynamic and thermal loads. This capability is required to design composite structures and will allow accurate assessment of contractor predictions and proposals. New structural concepts were developed for battle damage repair, titanium and

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aluminum metal-matrix composites, superplastically formed aluminum, and survivable composite fuel tanks. Major technical issues were clarified for the active and passive control of vibrations of optical space structures.

(2) (U) FY 1983 Planned Program: In order to provide improved combat effectiveness, prediction and design techniques will be developed for high angle of attack, transonic maneuvering, and low speed flight conditions. The verification of composite material structure design tools will be accomplished through ground test and service life tracking. Other efforts will include: (1) development of bolted composite joint design criteria, (2) definition of rapidly solidified alloy and metal-matrix composite durability, (3) the development of thermal shaping and vibration controls for space structures, (4) a high energy laser mirror isolation study, (5) the design of composite fuel tanks for survivability, (6) establishing guides for the repair of combat damaged structure, (7) development of Radar Absorbing Material/Radar Absorbing Structure (RAM/RAS) for wing leading edges, and (8) the development of new methods to combine structural certification with high temperature testing in the structures test facility.

(3) (U) FY 1984 Planned Program: The development of a flutter suppression system that can adapt to many wing store configurations will continue. The design and development of the Aircraft Ground Induced Loads Excitation (AGILE) laboratory system, which applies dynamic loads through the landing gear to the aircraft, will be completed. A superplastic formable aluminum aircraft structure will be validated. Other efforts will include: (1) development of integral damping concepts for fuselage structures, (2) development of aircraft and spacecraft structure design methods to minimize weight, (3) evaluation of large composite postbuckled panel durability, (4) development of structural design concepts for spacecraft joints, and (5) development of structural test methods, including the automated detection of structural crack propagation in aircraft fatigue tests.

B. (U) Project: 2402, Vehicle Equipment. The purpose of this project is to acquire the technological base and provide demonstrated technologies in the areas of: (1) conventional and alternate flight vehicle take-off and landing systems, (2) windshields and transparency enclosures, (3) cryogenic cooling, (4) internal environmental control, (5) flight vehicle vulnerability to ballistic threats and natural environmental hazards, (6) emergency crew escape, and (7) combined environmental reliability testing. These technological advancements will significantly affect the life cycle cost of subsystems and equipment, increase the probability of flight vehicle and crew member survival, and improve flight vehicle operational capabilities. In addition, the project will demonstrate options for improved equipment/system design and performance and establish the associated scientific and engineering foundation for these technologies.

(1) (U) FY 1982 Program: The results obtained in the Combined Environments Reliability Test (CERT) facility were transitioned to military specifications for internally carried avionics. Assessments and preliminary designs for emergency crew escape concepts in high speed manned vehicles were completed. Current systems provide safe crew escape only up to moderate subsonic speeds. In regard to conventional landing gear, efforts include the development of radial ply tires and active control landing gear struts, which will allow aircraft operation on battle damaged and repaired runways. The development of microprocessor controlled closed loop environmental control concepts was initiated. Also, characterization of the atmospheric electricity hazard (lightning) was completed through extensive ground and in-flight measurements conducted during the past three fiscal years.

(2) (U) FY 1983 Planned Program: Cryogenic cooler technology will be extended to provide the low temperatures required for the operation of on-board Josephson Junction Processors. Efforts will continue on expanding the safe ejection envelope using a microprocessor to control ejection seat trajectory during egress. Crew survivability will be enhanced by reducing pre-ejection time delays and improving man/seat system stability. Cryogenic cooler component development for air-to-air missile infrared sensors will be completed. Computer aided design techniques, which include heat load and environmental control considerations in avionics designs, will be completed. There will be continued development of methodologies to determine the residual strength of composite structures after projectile or fragment impact. Other efforts will include: (1) rough/soft landing gear fabrication and evaluation, (2) advanced aircraft brake system component development, (3) development of lightning protection for composite fuel tanks, (4) evaluation of Halon dry bay protection, (5) development of missile cryogenic seals, and (6) utilization of the Integrated Thermal Aided Design (ITAD) program for Environment Control System (ECS) development.

(3) (U) FY 1984 Planned Program: Efforts will include: (1) continued development and performance evaluation of a closed cycle cryogenic cooler capable of providing liquid helium (4.2°K temperature) refrigeration for the environmental support of Josephson Junction superconducting devices, (2) ejection seat aero and flight control development/evaluation, (3) development of integrated environmental engineered electronics to achieve large electronic systems improvements with regard to cost, reliability and maintainance, (4) rough field landing gear testing, (5) lightning generator equipment improvement, (6) development of a design guide for lightning resistant composite fuel tanks, (7) transparency (windshield) test method verification, and (8) development of design guides for armor and fuel tank and inlet duct protection.

C. (U) Project: 2403, Flight Control. The purpose of this project is to develop flight control systems technology that matches the vehicle performance and dynamic characteristics, armament, and mission systems with the pilot. In this way the maximum capability can be obtained while assuring safety, survivability and economy. The elements of flight control technology include cockpit display and controls, control logic, aircraft stability and control, control sensors, and actuation subsystems. Laboratory, wind tunnel, simulator, and flight tests will also be necessary to demonstrate the validity of advanced control concepts, devices, and techniques. An important means of technology transition is through specifications, handbooks, design guides and criteria, and technical reports.

(1) (U) FY 1982 Program: Began development of integrated control concept simulations which support alternate penetration tactics such as high speed dash, terrain following, terrain masking, and evasive maneuvering. These simulations support cockpit hardware technology development required to provide the flight crew with essential mission data and systems status for effective operations. The development and maintenance of Data Compendium (DATCOM), the free world standard for estimating stability and control characteristics of aircraft conceptual designs, was continued, and work was begun to extend it to missile configurations. Integrated tactical contract studies, speech technology development, and pictorial format displays were also pursued.

Program Element: #62201F | Title: Aerospace Flight Dynamics
DOD Mission Area: #523 - Engineering Technology (ED) | Budget Activity: #1 - Technology Base

(2) (U) FY 1983 Planned Program: The multifunction flight reference system program continues to be an AFSC initiative. It is expected to flight demonstrate two strap-down, skewed, ring laser gyroscope assemblies in an F-15. A radar warning simulation system will be installed in the Large Amplitude Multimode Aerospace Research Simulator (LAMARS). Newly emerging digital architecture will be applied to flight control systems to improve reliability, supportability and vehicle survivability. The flying qualities specification will be expanded to include large aircraft such as bombers, missile carriers, and transports in the million pound plus class. Validated design criteria for the low-speed, power-lift flight phases of Short Take-off and Landing (STOL) vehicles and for terrain following/terrain avoidance algorithims, which increase aircraft survivability and mission effectiveness, will be developed. Also, a threat management design and development program to augment the Tactical Flight Management Program will begin. A design for a new variable stability fighter flight simulator to replace the NT-33, will be accomplished. Voice technology applications to flight control will be demonstrated in the KC-135 Speckled Trout aircraft.

(3) (U) FY 1984 Planned Program: The multifunction flight reference system demonstration will be completed and transitioned to the Integrated Inertial Reference Assembly program. In addition, flat panel display development will continue. Other FY 1984 efforts include: (1) threat management display development, (2) installation of a helmet mounted display for the manned combat station simulator, (3) integrated system software design and verification, (4) distributed microprocessor flight on Digitac III, (5) electromechanical actuator demonstration, (6) computer aided design for integrated control systems, (7) voice technology applications for fighter cockpits, and (8) artificial intelligence applications for system fault detection and maintenance.

D. (U) Project: 2404, Aeromechanics. The purpose of this project is to initiate and conduct technology programs in the areas of aerodynamics, aerothermodynamics, performance analysis, configuration research, technology assessment and integration, and wind tunnel and flight experiments. These technology programs are directed toward improved mission capability and survivability, reduced development risk, and reduced development and operation cost. Fundamental technology base efforts include development of: (1) test and prediction techniques, (2) design criteria, (3) wind tunnel simulation and flight test correlation, and (4) configuration and component options to enhance mission performance.

(1) (U) FY 1982 Program: An effort to study volumetrically efficient advanced missile vehicle aerodynamics was expanded to include innovative configurations for maneuvering reentry vehicles and orbital lifting vehicles. The results were compiled in a design guide and have been published and transmitted to industry. Aerodynamic and aeroheating prediction techniques were explored for air launched, highly manuverable missile configurations. Tests were conducted to gather data which verified and validated numerical techniques for calculating flow fields and aerodynamic heating. Studies were initiated to assess the technical problems resulting from the application of configuration shaping to reduce radar signatures of current and advanced weapons. The utilization of in-house experimental aerodynamic facilities was continued with an emphasis on clean, affordable flow visualization facilities such as water and smoke tunnels. Advanced tactical and strategic aircraft configurations were investigated to define vehicles with increased range, payload, survivability and reduced life cycle cost. Technologies were explored which offer solutions to the problem of sustaining combat operations off of damaged runways and alternate surfaces.

Program Element: #62201F Title: Aerospace Flight Dynamics
DOD Mission Area: #523 - Engineering Technology (ED) Budget Activity: #1 - Technology Base

(2) (U) FY 1983 Planned Program: Efforts will begin to define critical technologies for multipurpose fighter-interceptor configurations. Wind tunnel and radar cross section tests are planned to verify aerodynamic stability, performance and detectability characteristics of advanced Short Take-off and Landing (STOL) tactical and strategic aircraft configured with and without weapons. There will be an assessment of the degradation of performance of aerodynamically configured missiles because of design compromises to minimize observables. Evaluation of flight vehicle concepts for the effectiveness of standoff ballistic glide and cruise weapons will continue. Additional refinements of aerodynamic and functional performance prediction techniques, which efficiently use computer time and resources, will be emphasized. An effort to correlate flight data with wind tunnel test results and analytic predictions will be completed. Aircraft and missile performance prediction techniques will be integrated to allow trade-offs to be made which will maximize overall weapon system performance. Other planned efforts include: (1) supersonic persistence technology development, (2) low altitude aircraft configuration technology development, (3) Advanced Military Spaceflight Capability (AMSC) configuration analyses and optimization, (4) STOL technology investigations, (5) vortex/linear lift technology development, (6) technical options for alternate take-off and landing, (7) Maneuvering Reentry Research Vehicle (MRRV) design and wind tunnel test, and (8) development of survivable fighter technologies.

(3) (U) FY 1984 Planned Program: The development and exploration of strategic aircraft options featuring highly survivable system integration concepts and enhanced performance is planned. Vehicle concepts for strategic applications, including penetration, reconnaissance, intercept, and airlift, will be identified. Design criteria for high performance conformal inlet and exhaust nozzle concepts in highly integrated airframe-propulsion installations will be established. Aeromechanic technologies for key aerospace problems such as non-catalytic heating effects will be assessed for improved confidence and reduced costs. Other development efforts include: (1) highly integrated nozzle and exhaust cooling technology, (2) laser hardening through the use of fluid mechanics, (3) reduced weapons carriage aerodynamic drag and observerables, (4) Advanced Military Space Capability (AMSC) technologies, (5) STOL thrust vectoring, (6) defense suppression driving technologies, (7) numerical heat transfer calculation techniques for realistic configurations, and (8) performance component improvements for advanced maneuvering missiles.

8. (U) PROJECT: 06FF, Laboratory Operations (PROJECT OVER $10 MILLION IN FY 1984):

A. (U) Project Description: This project provides for the support activities required to operate the Flight Dynamics Laboratory, Air Force Wright Aeronautical Laboratories, Wright-Patterson Air Force Base, OH. It includes pay and benefits for civilian scientists, engineeers and support personnel; travel, transportation, rents, communications, computer network, and utilities costs; and procurement of supplies, equipment and contractor support services.

B. (U) Program Accomplishments and Future Efforts: Not Applicable.

C. (U) Major Milestones: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #62202F — Title: Aerospace Biotechnology
DOD Mission Area: #522 - Environmental and Life Sciences (ED) — Budget Activity: #1 - Technology Base

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	37,921	40,500	43,614	46,705	Continuing	N/A
06MD	**Aerospace Medical Division Laboratory Operations**	19,994	20,217*	20,977	21,303		
2729	Chemical Defense	696	3,050	3,600	4,000		
6302	Occupational and Environmental Toxic Hazards in Air Force Operations	2,869	2,700	2,900	3,250		
6770	Biotechnology Studies in Advanced Systems	75	333	627	667		
6893	Manned Weapon Systems Effectiveness	2,465	1,400	1,600	1,775		
7184	Man-Machine Integration Technology	4,330	4,269	4,400	4,720		
7231	Safety and Aircrew Effectiveness in Mechanical Forces Environments	2,565	2,750	2,860	3,240		
7755	Aerospace Medicine	711	800	900	1,000		
7757	Radiation Hazards in Aerospace Operations	3,094	3,400	3,900	4,450		
7930	Advanced Crew Technology	1,122	1,581	1,850	2,300		

*Excludes 1 Oct 82 Civilian Pay Raise.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Aerospace Biotechnology is the core Air Force technology base program to optimize the role of the human operator in the design, development, and operation of increasingly complex and technologically sophisticated weapon systems. The four key thrusts of the biotechnology program are: (1) to improve the performance of the human component of weapon system/operations by refining crew selection and maintenance, crew protection, and man-machine integration; (2) to improve safety and environmental protection from radiation, chemical, and mechanical forces noise; (3) to establish threat characterization and countermeasures effectiveness against Soviet weapon systems; and, (4) to develop chemical defense measures for air base operations, casualty care evacuation, and personal protective equipment. Key factors driving the increasing investment in this program include: reliance on more technology-rich hardware systems to counter the numerical superiority of threat systems; the requirement to reduce life cycle costs of weapon systems; the national environmental concern with lifetime effects of exposure of various forms of radiation and chemicals; and, the need to retain operationally experienced aircrews. The program funds the operational support and management for the research and development activities performed by the Aerospace Medical Division, Brooks AFB TX. This includes the Air Force Aerospace Medical Research Laboratory, Wright-Patterson AFB OH, and the USAF School of Aerospace Medicine, Brooks AFB TX.

Program Element: #62202F
DOD Mission Area: #522 - Environmental and Life Sciences (ED)

Title: Aerospace Biotechnology
Budget Activity: #1 - Technology Base

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
RDT&E	35,959	41,718	44,777		Continuing	N/A

The difference in FY 1983 funding is due to a Congressional reduction. The primary reductions were made in: Project 7757, Radiation Hazards in Aerospace Operations; Project 6893, Manned Weapon Systems Effectiveness; and, Project 6302, Occupational and Environmental Toxic Hazards in Air Force Operations. These reductions have resulted in the descoping of studies to determine bioeffects of long term exposure to radio frequency radiation, experiments to determine performance effectiveness of ground to air threat system operators and efforts to identify physiological mechanisms by which toxic substances act on the human body.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

Military Construction Funds	5,490	/ 325	·510	3,925

5. (U) RELATED ACTIVITIES: *The Biotechnology Program* is one of the program elements formally coordinated under the Armed Services Biomedical Research and Evaluation and Management (ASBREM) Committee. This committee is modeled after the Joint Logistics Commanders' forum, is chaired at the general officer level, and serves as the coordinating and program review agency for DOD Medical and Life Sciences research and technology. Formal mechanisms with other federal agencies include the NASA-Air Force Systems Command Interdependency Working Group, and the Joint Army Navy-NASA (JANNAF) Propulsion Committee. The program is coordinated on an international basis through the Air Standardization Coordinating Committee, and several North Atlantic Treaty Organization groups including the Military Agency for Standardization, the Defense Research Group, and the Advisory Group for Aerospace Research and Development. In addition, bilateral agreements and Data Exchange Agreements are in effect with appropriate friendly nations. Within Air Force Systems Command the program is formally presented to Product Division Commanders and their Systems Program Directors on a recurring basis, integrated planning is achieved with other laboratories on new systems concepts, and joint technology programs are developed and executed. Existing joint technology programs include crew station design, ejection seat design, threat simulation, environmental quality criteria, audio and visual countermeasures, and chemical defense. Where coordination is required on a daily basi operating locations have been established with other organizations. These include positions with HQ Army Medical R&D Command, Fort Detrick MD, Army Institute of Chemical/Biological Defense at Aberdeen Proving Ground MD, Army Aeromedical Laboratory, Fort Rucker AL, Naval Medical Research Institute, Bethesda MD, and Air Force Flight Test Center/ NASA Dryden Research Center, Edwards AFB CA.

Program Element: #62202F
DOD Mission Area: #522 - Environmental and Life Sciences (ED)

Title: Aerospace Biotechnology
Budget Activity: #1 - Technology Base

6. (U) WORK PERFORMED BY: The Biotechnology Program is conducted by the Aerospace Medical Division through its two laboratories: the United States Air Force School of Aerospace Medicine, Brooks Air Force Base TX, and the Air Force Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base OH. The in-house portion of the program is centered on unique, complex, man-rated experimental facilities which are generally not available in the aerospace industry or academic institutions. The contract portion of the program complements the in-house efforts. The five major contractors are: University of California at Irvine, Irvine CA (Project 6302); Systems Research Laboratories, Inc., Dayton OH (Project 7231); System Development Corporation, Santa Monica CA (Project 7184); Dayton University Research Institute, Dayton OH (Project 7231); Arthur D. Little, Inc., Cambridge MA (Project 6302). There are an additional 72 contractors with FY 1984 contract values at $19.1 million.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project #2729 - Chemical Defense. Fully coordinated with the Army as lead DOD agency, this project addresses needs that are specific to Air Force operations in four functional areas: personal protective equipment; airbase operations; air and ground crew performance; and, medical operations and equipment technology. FY 1982 accomplishments include: (1) technology transfers to advanced development of a vital signs monitor, advanced aircrew chemical defense respirator, and a piezoelectric chemical warfare detection system; and, (2) the identification of five potential chemical agent simulants for field use. The FY 1983 program addresses efforts to: (1) develop specifications for microphone and voice emitters for air and ground crew protective masks; develop jointly with the Army, a field ventilator for chemical warfare casualties; (2) complete a first-generation chemical warfare commander's guide, a combined conventional/chemical casualty model for USAF air bases, and selection of the most promising technology for ground crew thermal protection; and, (3) continue priority efforts including resin polymer characterization for chemical agent detection systems, patient decontamination technology, airbase operations modeling, and agent detection, identification and warning technologies for air bases. Plans for FY 1984 include: (1) efforts to develop new shelter entry and exit procedures for aircrew and ground crew, new filtration technology and USAF air base detection and warning systems; (2) transition to Advanced Development of technology for a first-generation patient ventilator, a resin polymer based chemical agent detection system and specifications for a chemical warfare mask microphone and voice emitter.

B. Project #6302 - Occupational and Environmental Toxic Hazards in Air Force Operations: This project maintains sole research and development responsibility within the Air Force to identify and quantify toxic hazards created by chemical environments characteristic of advanced Air Force systems operations. Activities include: systematic studies of toxic hazards; determination of biological, toxicokinetics, and pharmocological bases of toxicity; establishment of human tolerance levels for engineering criteria; determination of effects of exposures on performance; identification of potential environmental toxicology problems; and, development of toxicologic methodologies and protocols. FY 1982 accomplishment include: the development of simulation models of the toxic mechanisms due to inhalation exposure to styrene and hexane (Air Force solvents) and completion of safe exposure criteria for the present cruise missile fuel (JP-10) for inclusion in an Air Force Occupational Safety and Health standard. The FY 1983 program addresses: (1) experiments to determine the toxicology of shale derived Air Force JP-4 jet fuel and new Air Force carbon slurrry fuels, and a parametric investigation of the toxicity of alternate aviation fuels; (2) completion of studies on the tumor

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: (continued)

B. Project #6302 - Occupational and Environmental Toxic Hazards in Air Force Operations: *(continued)*

causing potential of petroleum JP-4, methods to medically diagnose exposure to JP-10, and screening of proposed Air Force fuels, JP-7 and JP-TS (thermally stable), for their potential to cause developmental defects in animals; and, (3) continuation of high priority efforts on the tumor producing potential of JP-TS, JP-7 and development of safe exposure criteria to Methylcyclohexane, a component of JP-9. Plans for FY 1984 include: (1) efforts to study boron slurry, high energy fuel toxicology (cruise missile) and aquatic toxic mechanisms of alternate aviation fuels; and, (2) completion of efforts on the reproductive toxicology of shale JP-4, aquatic behavioral toxicology of alternate aviation fuels, safe exposure criteria for methylcyclohexane and, carbon slurry fuel toxicology.

C. Project #6770 - Biotechnology Studies in Advanced Systems: This project supports those general objectives of the Aerospace Biotechnology Program which do not fall logically under the responsibility of a single subelement of the Aerospace Medical Division and are, therefore, managed at Headquarters, Aerospace Medical Division. Three categories of effort are involved: (1) Air Force participation in support of such activities as the National Research Council; (2) those activities directed by higher headquarters which require timely integrated responses from several subelements, such as the specific requests for research and development from operational commands; and, (3) new interlaboratory programs during the planning and preliminary stages. In FY 1982, this project has supported production of: five technical publications in the care and usage of research animals; a monthly publication that covers current events, proposed legislation, new references, abstracts of relevant scientific papers, and new or proposed minimum standards for the care and use of research animals; and, weekly status reports relating to legislative matters. This project has also supported completion of vision research studies on simulation of low-level flight performed through the National Research Council's Committee on Hearing, Bioacoustics and Biomechanics. These studies identified principal objectives and problems with visual displays. In FY 1983, a new effort begins with the DOD Human Factors Engineering Technical Advisory Group to provide a mechanism for exchange of technical information in the development and application of human factors engineering technology. Plans for FY 1984 include the continuation of efforts through the Institute for Laboratory Animal Resources to provide publications relevant to research animal usage and monthly publications to keep the Air Force informed on proposed legislation that might impact our capability to conduct biomedical research, studies through the National Academy of Sciences/National Research Council's Committee on Hearing, Bioacoustics and Biomechanics on radiation hazards and ocular pathology associated with video display devices, analysis of visual task and performance requirements for jobs such as pilot and navigator, and, measurement of visual function.

D. Project #6893 - Manned Weapon Systems Effectiveness: This project provides from the threat system perspective, those human operator performance data needed to improve tactics, weapon system design and force structure determinations. Objectives are: to quantify the contribution of threat system operators to total threat effectiveness; to develop effective countermeasures against threat crew systems based on the vulnerability of the human operator; and, to develop man-in-the-loop and computer simulation procedures to assess the merit of competing weapon system designs. FY 1982

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: (continued)

D. Project #6893 - Manned Weapon Systems Effectiveness: (continued)

accomplishments include the completion of an optical detection and survivability analysis for the B1-B bomber, development of a data base on performance of surface to air missile system operators who use laser beam rider guidance systems and completion of a survivability analyses for F-15B and F-16 aircraft equipped with computer aided control systems. The FY 1983 program addresses efforts to continue development of camouflage defeat mechanisms, begin major new thrust in analysis of netted threat systems and continue development of technology for integrated control/display systems using eye/head, hand and voice control. Plans for FY 1984 include efforts: to defeat threat C^3 operations via C^3 operator deception and disruption; to complete development of visual/motion cue effects on simulaton fidelity; and, to complete study of jamming deception effects on C^3 operator decision making.

E. Project #7184 - Man-Machine Integration Technology: This project addresses methods to maximize the efficiency and effectiveness with which the human operator interfaces with and controls Air Force systems. The combination of low-level high-speed flight profiles with high threat densities and night/adverse weather environments increases the criticality of the human component to mission success. FY 1982 accomplishments include the completion of: a covert, infrared, night vision goggle compatible Landing Zone Indicator system for the Military Airlift Command; and initial study of human engineering requirements for Shuttle Operations and Planning Complex; and, the development of a strength aptitude test battery for enlisted Air Force personnel. The FY 1983 program addresses efforts to: provide a major new start in analysis of human factors issues for United States Air Force Shuttle Command and Control Operations; complete development of an Air Force pilot strength screening program; and, continue development of an objective metric to assess aircrew workload. Plans for FY 1984 include efforts to: complete development of a cockpit geometry design guide; complete development of technology for application of color displays to strategic electronic warfare operator stations; and, complete human engineering design reconfiguration of the North American Aerospace Defense Command Post.

F. Project #7231 - Safety and Aircrew Effectiveness in Mechanical Forces Environments: The objective of this project is to assure the mission effectiveness, safety, and health of Air Force personnel exposed to hazardous mechanical forces which occur during ejection, crash landing, routine flight, high-load factor maneuvering and ground operations. These forces include sustained and transient acceleration and deceleration, vibration, and noise. FY 1982 accomplishments include: initiation of a study to expand NOISEMAP (a computer program to map geographical areas of aircraft noise impact) to handle sonic booms and environmental buffering and magnification effects; validation in operational exercises (Red Flag) of methods to aid communication system operators in detecting and overcoming threat system jamming; determination of relative jamming effects on foreign languages; completion of tests to determine ejection criteria for upgrading the present ACES II seat; and, initiation of tests of high-speed windblast protection methods needed for future fighters. The FY 1983 program addresses efforts to: initiate analysis of methods to improve intelligibility of synthetic speech; transition to advanced development the technical specifications for an adaptive pilot restraint system and for the aerodynamic design of ejection seats to reduce the effects of windblast; and, development of specifications for signal processors to increase headset intelligibility. Plans for FY 1984 include

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: (continued)

F. Project #7231 - Safety and Aircrew Effectiveness in Mechanical Forces Environments: (continued)

efforts to: develop new concepts for aircrew protection during emergency escape from advanced stealth fighters; complete feasibility study of incorporating sonic boom parameters into NOISEMAP; finalize evaluation of SEEK TALK and morse code jammer deception technologies; quantify jammer effectiveness on intelligibility; update NOISEMAP for air training routes; and, begin development of a sonic boom forecast capability.

G. Project #7755 - Aerospace Medicine: This project develops methods to insure that: the best medical selec criteria are applied to applicants for Air Force Undergraduate Pilot Training and Undergraduate Navigator Training; prevention and prediction of disease and refinement of retention criteria are optimized to increase the career life expectancy or "cockpit longevity" of the USAF flyer. FY 1982 accomplishments include: establishment of medical standards for United States Air Force manned space flight engineers; increased application of noninvasive diagnostic techniques to 660 grounded aircrews during FY 1982 which resulted in the return of 75 percent to the cockpit; and, transition of the Hearing Conservation Program from research and development into permanent, operational use at the Air Force Occupational and Environmental Health Laboratory. The FY 1983 program addresses efforts to: analyze the value of night vision goggles for Air Force low altitude, air-to-ground (A-10 aircraft) operations and establish standards for their use; demonstrate the utility of soft contact lenses for use in a chemical warfare environment; and develop contrast sensitivity standards to augment visual standards for aircrew. Plans for FY 1984 include efforts to: initiate a program on neurochemical techniques to enhance information processing, decision making, alertness, and general bioreactivity; demonstrate new techniques to control space motion sickness; and, complete new neuropsychologic test norms for aircrews of advanced aircraft.

H. Project #7757 Radiation Hazards in Aerospace Operations: This program assesses biological hazards, suggests countermeasures and quantifies acute and delayed biological effects of nonionizing, radiofrequency, ionizing, laser, nuclear flash, and particulate radiation on Air Force personnel. Operationally, personnel hazard assessments, safe separation distances, protective devices, and the predictions of air and ground crews' ability to maximally perform in a laser, radiofrequency or nuclear radiation environments are essential. FY 1982 accomplishments include the completion of site surveys for the Southwest PAVE PAWS radar, participation in several town meetings/discussions for radar site selection, and completion of preliminary studies of the effects of high-energy lasers on various aircraft windscreens in conjunction with the US Army. The FY 1983 program addresses efforts to: complete the environmental impact statement for Southwest and Southeast PAVE PAWS; establish thresholds for single pulsed high energy lasers on windscreens of Air Force inventory aircraft in conjunction with Los Alamos National Laboratory (LANL); and, perform radiation hazard assessments for space crews potentially operating in polar orbits. Plans for FY 1984 include efforts to: determine bioeffects of millimeter waves; establish thresholds for multiple pulsed, high energy lasers on windscreens of Air Force inventory aircraft in conjunction with LANL; develop methods to predict aircrew performance decrements associated with combined ionizing irradiation and dilute chemical materials; and, develop an ionizing irradiation model for space sickness.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: (continued)

I. Project #7930 - Advanced Crew Technology: Specific goals of this effort are: to advance life support equipment to fulfill current and future Air Force requirements; to reduce aircraft mishaps attributed to human error; and, to advance aeromedical evacuation system technology. Current and future aircraft which have the capability to exceed physical tolerances of the aircrew require advances in such technology to increase boundaries of operations and to reduce the increasing cost of aircraft mishaps, at least half of which are caused by human error. FY 1982 accomplishments include: development of an aircraft accident investigator's checklist to identify specific causes of human error; completion of testing of a near mishap reporting system and initiation of a fielded near mishap reporting system with the Military Airlift Command; developed specifications and preliminary designs for an advanced molecular sieve oxygen system for the B-1B bomber; completion of a physical fitness test program for United States Air Force personnel; and, provided a denitrogen staged decompression schedule for NASA extra vehicular activities. The FY 1983 program addresses efforts to: define in cooperation with the Military Airlift Command research and development efforts necessary to increase medical readiness of the Civilian Reserve Air Fleet for strategic aeromedical evacuation; complete fielding of a near mishap reporting system and initiate the human factors checklist into field use by accident investigators; and, develop design concepts to integrate pilot headgear into an effective life support system responsive to requirements for light weight, good visibility and yet protective against chemical agents and a high gravitational force and altitude environment. Plans for FY 1984 include efforts to: complete specifications for an electromechanical oxygen regulator; transition molecular sieve oxygen generation technology to the B-1B bomber program office; and, transfer technology for advanced development of a uniform pressure suit needed to counter gravitational forces which restrict effectiveness of aircrews in high performance aircraft.

8. (U) PROJECT 06MD - AEROSPACE MEDICAL DIVISION LABORATORY OPERATIONS (PROJECT OVER $10M IN FY 1984)

A. (U) Project Description: This project provides the resources to conduct the in-house research and development activities of the Aerospace Medical Division at Brooks Air Force Base TX and its research and development laboratories. It accounts for about 49 percent of the exploratory development funds for this program which is predominantly conducted by specialized scientific teams using complex, unique research facilities and devices. The project provides for the pay and related costs of civilian physicians, scientists, engineers and support personnel as well as for travel, transportation, rents, communications, utilities, laboratory supplies and unique equipment and other related costs needed to conduct biotechnology research and development. The program managed by the Aerospace Medical Division is one of research and exploratory development in biotechnology. The research and development efforts are designed to specifically define man's limits with regard to adaptability, survivability, and performance capabilities within his operational environment. These coordinated efforts form the basis for: (1) designing more effective weapon systems which capitalize on and enhance man's abilities; (2) developing realistic trade-off options in system design and mission planning to increase overall effectiveness and achieve economy of operations; (3) assuring maximum protection and survivability of aircrew consistent with mission requirements dictated by national objectives; and, (4) establishing realistic criteria for selection and care of the military personnel to maintain a strong and viable Air Force fully responsive to operational requirements and national goals.

Program Element: #62202F
DOD Mission Area: #522 - Environmental and Life Sciences (ED)

Title: Aerospace Biotechnology
Budget Activity: #1 - Technology Base

8. (U) PROJECT 06MD - AEROSPACE MEDICAL DIVISION LABORATORY OPERATIONS (PROJECT OVER $10M IN FY 1984): (continued)

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Not applicable.

(2) (U) FY 1983 Program: Not applicable.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Not applicable.

C. (U) Major Milestones: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #62203F Title: Aerospace Propulsion
DOD Mission Area: #523 - Engineering Technology (ED) Budget Activity: #1 - Technology Base

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	54,528	53,000	56,393	60,239	Continuing	N/A
06PP	Laboratory Operations	16,298	17,881*	18,364	18,607		
3012	Ramjet Technology	6,510	5,400	6,212	7,380		
3048	Fuels, Lubes & Fire Prot	7,480	7,359	8,259	7,914		
3066	Turbine Engine Technology	16,230	14,610	15,547	17,417		
3145	Aerospace Power Technology	8,010	7,750	8,011	8,921		

* Excludes 1 Oct 82 civilian pay raise

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element develops propulsion and power technology in support of current and future aerospace vehicles and weapons systems. Exploratory development and component/subsystem evaluations are conducted in the technical areas of turbine engines, ramjet engines, fuels, lubricants, and fire protection technology as well as aerospace power generation, distribution and control technology. The program also provides for the operation and management of the Aero Propulsion Laboratory at Wright-Patterson Air Force Base, OH.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	53,918	58,645	60,547		Continuing	N/A

In FY 1982 this program element was increased by $610,000 for increased support to the liquid fuel ramjet and ducted rocket propulsion areas and for civilian pay raises. In FY 1983, the program element was reduced $5,645,000 by Congress with no rationale. The reduction was administered proportionally across the four projects resulting in a substantial reduction of FY 1983 new starts. In FY 1984, the Air Force reduced the program element $4,154,000 with an additional reduction of new start programs.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

Military Construction Funds	0	0	0	2,845	N/A	N/A

Program Element: #62203F   Title: Aerospace Propulsion
DOD Mission Area: #523 - Engineering Technology (ED)   Budget Activity: #1 - Technology Base

5. (U) RELATED ACTIVITIES: This program receives information and technology from PE 61102F, Defense Research Sciences. It interacts with other exploratory development program elements and feeds PE 63202F, Aircraft Propulsion Subsystem Integration; PE 63211F, Aerospace Structural Materials; PE 63215F, Aviation Turbine Fuels Technology; PE 63216F, Advanced Turbine Engine Gas Generator; and PE 63302F, Advanced Missile Propulsion. Coordination with Army, Navy, National Aeronautics and Space Administration (NASA), Department of Energy, Department of Transportation, Environmental Protection Agency, industry and academia is accomplished by joint projects, information exchanges and standing committees, such as the Interagency Advanced Power Group and the NASA/Air Force semi-annual meetings, and the Joint Army-Navy-NASA-Air Force Interagency Propulsion Committee.

6. (U) WORK PERFORMED BY: Work is managed and performed by the Aero Propulsion Laboratory, Wright-Patterson Air Force Base, OH. Other Air Force organizations involved are the Aeronautical Systems Division, Wright-Patterson Air Force Base, OH; the Space Division, Los Angeles, CA; and Armament Division, Eglin Air Force Base, FL. The five major contractors for the program in FY 1982 were: General Electric, Evendale, OH and Lynn, MA (all projects); United Technologies, East Hartford, CT and West Palm Beach, FL (Projects 3066, 3012, 3048); McDonnell Douglas Aircraft, St. Louis, MO (Projects 3066, 3012, 3145); Garrett Corporation, Los Angeles, CA and Phoenix, AZ (Projects 3066, 3048); and Boeing Company, Seattle, WA (Projects 3012, 3048, 3145). There are 79 additional contractors working on 159 contracts worth $17,800,000.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: 3012. Ramjet Technology - This project develops ramjet component and engine technology to improve performance and reduce costs of tactical and strategic air-launched missiles. Ramjet propulsion concepts being evaluated include: variable fuel flow ducted rockets for tactical air-to-air missiles, solid fuel ramjets, and high payoff components for liquid fuel ramjets for long range strategic missiles. These efforts include component development of inlets, gas generators, combustors, nozzles, fuel controls, and engine technology demonstrators. Emphasis is on solid fueled ducted rockets for tactical missile applications and liquid fuel ramjets for strategic applications. FY 1982 Program Accomplishments - A major milestone was achieved in March 1982, with the successful performance verification of the ducted rocket engine during ten tests conducted over the tactical medium-range air-to-air missile operating envelope. The air inlet on the ducted rocket was used to evaluate the skid-to-turn and bank-to-turn maneuvers. Concurrent tests were also completed to demonstrate eliminating all ejecta (combustion port covers and rocket nozzle). FY 1983 Program - Design and demonstrate a liquid fuel ramjet propulsion system which satisfies cruise missile propulsion requirements for high altitude, high speed, and long range. Demonstrate a variable flow ducted rocket with high energy fuel. FY 1984 Program - Continue emphasis on variable flow ducted rockets and swirl combustion for liquid fuel ramjets.

Program Element: #62203F Title: Aerospace Propulsion
DOD Mission Area: #523 - Engineering Technology (ED) Budget Activity: #1 - Technology Base

B. (U) Project: 3048. Fuels, Lubrication & Fire Protection Technology - Efforts under this project are oriented toward providing improved and economical fuels, fuel management technology, lubricants and lubrication techniques, bearing and gear technology, and fire protection methods and techniques which will satisfy the stringent requirements of present and future aircraft and air-breathing missile systems. Approaches to meet the ojectives of this project include: investigation of fuel processing techniques to establish their effects on the future composition, performance properties and cost of jet fuels produced from domestic resources (oil shale, tar sands, coal); development of fuels and lubricants with improved high temperature properties; development of high energy density fuels; development of advanced analytical techniques for fuel combustion measurement and fuel and lubricant chemical characterization; development of advanced bearing concepts including solid and gas lubricated configurations; and development of advanced aircraft fire and explosion prevention, detection and suppression techniques. FY 1982 Program Accomplishments - The ability of an optimized catalyst to hydrocrack whole shale oil into high yields of jet fuel material was demonstrated. This single pass catalyst system produces a 75% yield of aviation fuel at lower cost than present methods. Developed a nuclear magnetic resonance (NMR) technique for the detailed characterization of jet fuels. Laser-based combustion diagnostic techniques were used to measure combustion phenomena for turbine and ramjet engines for use by combustor designers and modelers. Initiated development of a portable graphite furnace atomic absorption spectrometer for determining engine bearing health from lubricating oil samples. Demonstrated the feasibility of electron beam hardening for improving fracture toughness properties of bearing materials. Continued development of a foil journal bearing for use in the hot turbine end of an auxiliary power unit by completing a 200 hour endurance test under simulated engine operating conditions. Demonstrated high speed endurance capabilities of an improved design large cylindrical roller bearing. Developed corrective action for the A-10 aircraft static electricity fire hazards, and developed procedures for a combustible vapor alarm for lower volatility JP-8, JP-9 and JP-10 fuels. FY 1983 Program - The emphasis in FY 1983 will be to determine the effect of operational quality shale oil fuel on fuel system components and modify the JP-4 fuel specification for operational use of shale fuel, demonstrate the performance of a second generation carbon slurry fuel on a turbine engine for missile applications, conduct tests to determine acceptability of reclaimed lubricants for use in turbine engines; demonstrate in an engine a main shaft ball bearing fabricated from improved fracture toughness bearing material, demonstrate a tapered roller bearing for Advanced Turbine Engine Gas Generator (ATEGG) rotor support, evaluate two on-board inert gas generator (OBIGG) techniques for fuel tank explosion protection and develop advanced dry bay fire suppression measures. FY 1984 Program The emphasis in FY 1984 will be to evaluate fuels produced from tar sands and heavy oils, to develop boron slurry fuels and solid fuels for ramjet applications, conduct qualification of two new lubricants under MIL-L-7808, complete development of improved corrosion resistant bearings for engine application, demonstrate, with analytical verification, a 3 million DN capability for small (less than 80 MM) cylindrical roller bearings, and determine the flammability properties of combustible aircraft fluids under dynamic environmental conditions.

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Program Element: #62203F Title: Aerospace Propulsion
DOD Mission Area: #523 - Engineering Technology (ED) Budget Activity: #1 - Technology Base

C. (U) Project: 3145. Aerospace Power Technology - This project includes the development of solar power, fuel cells, batteries, hydraulics and power conversion, conditioning and transmission for both space and non-space applications. These analytical and experimental efforts form a balanced, broad base in power subsystem technology responsive to anticipated needs of aeronautical, missile, space and electronic systems including special ground power needs. General goals are increased power output, decreased weight and volume, decreased vulnerability, increased life and reliability and increased tolerance to environments, to provide effective technology and capability options in conceptual phases of future systems. FY 1982 Program Accomplishments - A Gallium Arsenide solar cell panel which provides for a 25% increase in onboard power without major vehicle redesign was demonstrated on a satellite. Nickel-Hydrogen batteries which increased power by 30%, extended orbital lifetime, and provided improved autonomy were demonstrated on a satellite. A LOX/JP-4 gas generator for producing tens of megawatts of high electrical power for directed energy weapons and railguns was also demonstrated. Demonstrated a lithium aluminum-iron disulfide battery which improved tactical missile performance while providing a 25% reduction in weight and volume. FY 1983 Program - Continue improvements to nickel electrode substrates and active material analysis techniques in solar cells, pursue increased efficiency improvements for gallium arsenide and multiband-gap solar cells, conduct in-house evaluations of a 5KW fuel cell power system for remote MX sites, develop and test a non-flammable hydraulic brake system for the KC-135 aircraft, investigate thermal energy storage for surveillance satellite needs, initiate work on autonomous solar array concepts, and study the component needs for power system integration for directed energy weapons. FY 1984 Program - Continue efforts to develop hardened solar cell systems against pulsed and continuous wave lasers. Develop techniques to handle very large thermal energy loads, demonstrate a 12 KWH lithium thionyl chloride battery for remotely piloted vehicle (RPV) propulsion, demonstrate improved rotor systems for permanent magnet generators, initiate development of a stirling cycle engine ceramic heater head quadrant for mobile power systems, fabricate and conduct a no-load test of a prototype 20 MW superconducting generator, initiate power conditioning analysis for advanced electronic warfare (EW) systems, support railgun development by developing a high current, repetitive switch, homopolar generator and complementary gas generator/turbine technology.

8. (U) PROJECT 3066, Turbine Engine Technology (PROJECTS OVER $10 MILLION IN FY 1984):

A. (U) Project Description: The purpose of this project is to conduct exploratory development on advanced turbine engine component technologies to provide superior turbopropulsion systems for future Air Force missions. This project develops technology to increase propulsion system operational reliability, cycle flexibility and performance while reducing fuel consumption, weight, and acquisition and operational support costs. Both analytical and experimental efforts are conducted in fans and compressors, high temperature combustors, turbine and seals, controls, diagnostics and structural design techniques. This project considers the total propulsion system (inlet, engine, nozzle) and its integration into a weapon system.

Program Element: #62203F
DOD Mission Area: #523, Engineering Technology (ED)

Title: Aerospace Propulsion
Budget Activity: #1, Technology Base

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) (U) FY 1982 Accomplishments: A comprehensive in-house research program to study the causes and effects of titanium combustion in both contemporary and advanced compressors was successfully completed. Several fire-resistant coatings for titanium airfoil application were identified. Advanced light-weight, sheetmetal combustor liner segments completed performance and cyclic durability testing in the high temperature environment of an ATEGG core engine. Direct, multiple heat flux measurements on a turbine rotor were made using miniature thin-film heat transfer gages. Special analytical procedures and methodologies were established to characterize the reliability of advanced electronic control components. Application of new high strength, high temperature Titanium Aluminide materials was successfully accomplished, demonstrating both production feasibility and engine structural integrity on an F100 exhaust nozzle flap liner.

(2) (U) FY 1983 Program: New component development programs emphasizing increased stage pressure ratio compression systems and vane-blade interaction effects in advanced turbines will commence in FY 83. In addition, development and application of advanced composite systems to propulsion system components (including shafting, attachments, and static structures), will be continued. Programs to validate variable cycle control system logic and to incorporate aircraft/propulsion usage data into a reliable regression analysis model will also be initiated. Structural analysis and advanced diagnostic instrumentation development will also be continued.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request:

A continuing requirement exists for improved propulsion system operational reliability, reduced life cycle cost, increased performance in terms of thrust-to-weight and reduced SFC and improved component durability and life. The programs planned for FY 1984 are intended to provide component technology which will support these propulsion system needs. Many of the component development efforts to be initiated in FY 1984 will also undergo a formal performance and durability assessment in the Advanced Turbine Engine Gas Generator/Joint Technology Demonstrator Engine programs. Turbine engine programs will emphasize critical component developments supporting propulsion system technology needs projected for the early to mid 1990s. A high pressure ratio, axi-centrifugal compression system will begin development. Composite materials will be applied to critical attachment and interface regions within the propulsion system. Realistic test procedures for accurate turbine durability assessment during the engine development process will also be defined. Other new initiatives include advanced component development and design tool validation for small turbine components and the development of an integrated electronic diagnostic/ control system. Additionally, the development of advanced integrated electronic controls will emphasize flight/propulsion performance optimization.

Program Element: #62203F
DOD Mission Area: #523, Engineering Technology (ED)

Title: Aerospace Propulsion
Budget Activity: #1, Technology Base

New initiatives in FY 1984 will emphasize integrated flight/propulsion controls designed for fault-tolerance. Critical component development efforts to increase performance over 50% will be initiated based on the long range requirements study conducted in FY 1983 which will lead to an integrated technology demonstration in the early to mid 1990s. This will include innovative turbine cooling and heat transfer developments and the application of advanced ceramic and carbon/carbon materials to permit high temperature operation with little or no cooling air. In addition, relevant structural development efforts will also be initiated to meet projected life requirements.

Major on-going efforts to be completed during FY 1984 include the parametric blade investigation program resulting in delivery of a number of advanced compressor airfoil designs for subsequent design system validation using the in-house compressor test rig. Additionally, the full scale design of an advanced augmentor system will be delivered for subsequent integration and performance evaluation under the Joint Technology Demonstrator Engine (JTDE) program. A new high flow, high work variable-geometry turbine will also be ready for transition to the Advanced Turbine Engine Gas Generator (ATEGG) program for subsequent performance and durability assessment. AEDC performance testing of selected STOL nozzle concepts developed under the Rolls-Royce STOL/Exhaust Nozzle Program will be completed in FY 1984.

C. (U) MAJOR MILESTONES:

(1)	Multi-piece Turbine Blade Design Demo	1984
(2)	Desensitize Rotor Tip Clearance Effects	1985
(3)	Advanced Augmentor Design Validation	1986
(4)	Large Axi-Centrifugal Compression Design Validation	1987
(5)	Advanced Hi-Work Turbine Demo	1987
(6)	Full Integrated Flight/Propulsion Control System Demo	1988
(7)	Small Turbine Design Criteria Established	1988
(8)	Demonstrate Stagnation-Free Engine Operation	1992

9. (U) PROJECT 06PP, Aero Propulsion Laboratory Support (PROJECTS OVER $10 MILLION IN FY 1984):

A. (U) PROJECT DESCRIPTION: This project provides for the support activities required to operate the Aero Propulsion Laboratory's exploratory and advanced development programs. The Laboratory provides technical support to current and future systems programs and undertakes operational support projects in its mission areas. The project provides for the pay and related costs for civilian employees, travel, transportation, rents, communications and utilities costs, and procurement of supplies.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS: Not applicable.

C. (U) MAJOR MILESTONES: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #62204F Title: Aerospace Avionics
DOD Mission Area: #521-Electronics and Physical Sciences (ED) Budget Activity: #1-Technology Base

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	62,828	67,634	70,113	74,341	Continuing	Not Applicable
06AA	Air Force Avionics Laboratory Operations	26,552	27,559*	28,359	28,632		
2000	Active Electronic Countermeasures	3,958	4,460	4,300	4,500		
2001	Electro-Optical Technology	3,105	3,110	3,200	3,300		
2002	Microwave Technology	6,176	7,155	7,372	8,000		
2003	Avionics System Design Technology	4,145	4,336	4,500	5,000		
2004	Technology for Reconnaissance and Targeting Avionics	2,389	2,842	3,100	3,400		
6095	Inertial Reference and Guidance Technology	1,963	2,011	2,000	2,150		
6096	Microelectronics Technology	3,857	4,375	4,500	5,400		
7622	All-Weather Reconnaissance/ Strike Avionics	4,030	5,255	5,700	6,500		
7629	Fire Control Avionics	2,232	2,425	2,460	2,600		
7633	Passive Electronic Countermeasures	3,323	3,096	3,622	3,840		
7662	Avionics Data Transmission and Reception	1,098	1,010	1,000	1,019		

*Excludes 1 Oct 82 civilian pay raise.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program is the primary source of new concepts, feasibility demonstrations, and technology evaluation for the full spectrum of Air Force avionic system needs. Mission areas addressed include target detection and classification, fire control and weapon guidance, navigation, communication, jamming and deception of hostile defenses, core avionics system design and avionic subsystem integration technology and the crucial supporting technology of electronic devices and circuits. Avionics advances have the potential to multiply weapon system effectiveness. Modern technology has also begun to yield enhanced reliability and reduced life cycle costs. The program also supports the operation and management of the Avionics Laboratory of the Air Force Wright Aeronautical Laboratories at Wright-Patterson Air Force Base, OH.

Program Element: #62204F — Title: Aerospace Avionics
DOD Mission Area: #521 - Electronics and Physical Sciences (ED) — Budget Activity: #1 - Technology Base

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
RDT&E	61,523	67,652	71,500		Continuing	Not Applicable

The difference in total FY 1984 funding between this and the previous year's Descriptive Summary is due to several factors. The costs of laboratory operation have grown, primarily driven by the 1 Oct 82 Civilian Pay Raise (4%). The overall funding for technical projects within the program element has decreased due to the transition of technology to advanced development and shifts in technological emphasis. These shifts in emphasis, reflected in project funding, are in response to projected operational requirements and threats, and take advantage of technological opportunities.

The reduced funding in Project 7622 is driven by the transition of two key technologies to advanced development in PE 63203F, Advanced Avionics for Aircraft. These technologies are automatic synthetic aperture radar target classification techniques and classification of slow moving targets. Effort will continue in these areas to identify and develop promising new techniques for next generation aircraft, but at a reduced level. Project 6095, Inertial Reference and Guidance Technology, will have less funding due to the transition to advanced development of molded thermoplastics technology for conventional gyroscopes and accelerometers. Further effort in low cost, moderate accuracy accelerometers will not be pursued, but effort will continue in high accuracy applications. Due to the potential payoff to the full spectrum of avionics and electronics systems in reliability, processing speed, and radiation hardness, increased emphasis has been placed on the development of gallium arsenide device technology in Project 6096, Microelectronic Technology. In Project 2003, Avionics System Design Technology, increased emphasis is being placed on efforts to improve the programmability and software support of advanced signal processors and embedded computers.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

Military Construction, Funds	0	0	600	9,670

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Program Element: #62204F Title: Aerospace Avionics
DOD Mission Area: #521 - Electronics and Physical Sciences (ED) Budget Activity: #1 - Technology Base

5. (U) RELATED ACTIVITIES: Since this program is a broad technology base effort, technology transfer takes place between a large number of related program elements. The most significant of these, to or from which a significant number of efforts are transitioned, include: Defense Research Sciences, 61101E; Defense Research Sciences, 61102F; Materials, 62102F; Strategic Technology, 62301E; Command, Control, and Communications, 62702F; Advanced Avionics for Aircraft, 63203F; Reconnaissance Sensors/Processing Technology, 63208F; Space Vehicle Subsystems, 63401F; Advanced Space Communications, 63431F; Very High Speed Integrated Circuits, 63452F; Conventional Weapons, 63601F; Electronic Warfare Technology, 63718F; Advanced Communications Technology, 63727F; Air-to-Air Identification of Non-Cooperative Targets, 63742F; Electro-Optical Warfare, 63743F; and Counter-Countermeasures Advanced Development, 63750F. Tri-Service and interagency coordination is continually accomplished. All electron device work is coordinated through the Advisory Group on Electron Devices which advises the Office of the Undersecretary of Defense for Research and Engineering. All work on fiber optics components and systems applications is coordinated through the Tri-Service Fiber Optics Coordinating Group. Developments in thermal imaging and image processing are coordinated through the Night Vision Technology Panel under the Joint Deputies for Laboratories Committee which, in turn, is under the Joint Logistic Commanders. Many areas of work are coordinated through the Air Force/National Aeronautics and Space Administration Interdependency Working Groups on Space and Aeronautics. Radiation hardening activities are coordinated through the Radiation Hardened Electronics Technology Coordinating Group. Work on flares and related devices is coordinated through the Tri-Service Pyrotechnics Coordinating Group. Infrared sensor developments are coordinated through the Joint Technical Coordinating Group on Thermal Imaging Sensors. Sensitive technology developments are coordinated through the Joint Technical Coordinating Committee (COCOM) to prevent disclosure to hostile nations. The Laboratory participates in a Joint Air Force/Navy Radar Working Group, a Tri-Service Airborne Displays Working Group, and a Tri-Service Background and Targeting agreement originated by the Air Force Armament Laboratory. In the area of standardization, the Laboratory is active in the Bubble Memory Standardization Subcommittee of the Joint Electronic Devices Engineering Council, and in national standards activities coordinated by the Society of Automative Engineers, especially in the area of aircraft data multiplexing systems. This extensive coordination activity ensures timely dissemination of progress to qualified parties and avoids wasteful duplication of efforts. Key program elements involved in this coordination include: Aircraft Avionics, 62202A; Electronic and Electron Devices, 62705A; Aircraft Avionics Equipment, 63702A; Night Vision Investigations, 62709A; Night Vision Advanced Development, 63710A; Electron Device Technology, 62762N; Avionics, 63203N; and Countermeasures Technology, 62734N.

6. (U) WORK PERFORMED BY: The Air Force Avionics Laboratory, Wright-Patterson Air Force Base, OH, manages the work performed under this program. Spcialized facilities operated by the Avionics Laboratory in support of this program include: The Electronic Warfare Anechoic Chamber, Electronic Defense Evaluator, Dynamic Electromagnetic Environment Simulator, Dynamic Analyzer, Computer-Aided Design Facility, Reference System Software and Evaluation Laboratory, 100-inch Collimater, Laser Research Laboratory, Radar Reflectivity Measurement Facility, Targeting Systems Characterization Facility, Global Positioning System Evaluation Facility, Ring Laser Gyro Laboratory, Communications Systems Evaluation Laboratory, Microelectronics Laboratory, Avionics System Analysis and Integration Laboratory, and Radar Signal Processing Laboratory . The five major contractors were: Hughes Aircraft Co., Culver City, CA; TRW, Rodondo Beach, CA; Environmental Research Institute of Michigan, Ann Arbor, MI; Raytheon Co., Bedford, MA; and

Program Element: #62204F   Title: Aerospace Avionics
DOD Mission Area: #521 - Electronics and Physical Sciences (ED)   Budget Activity: #1 - Technology Base

6. (U) WORK PERFORMED BY (CONTINUED):

Texas Instruments, Dallas, TX. The total number of contractors was 124. The total dollar value for all contracts was $105M.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project 2000: Active Electronic Countermeasures. The objectives of this project are to [

] FY 1982 Accomplishments: Project highlights include the following: [

] FY 1983 Program: [

] FY 1984 Planned Program: [

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B. (U) Project 2001: Electro-Optical Technology. This project develops lasers, detectors, and optical signal processing components for a wide range of functions in offensive and defensive avionic systems. Work includes development of broad bandwidth tunable lasers for search and countermeasures, advanced infrared detector arrays and signal processing for detection and imaging, lasers and detectors for laser radars, and optical components for threat

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B. (U) Project 2001: Electro-Optical Technology (Continued)

warning spectral analysis, correlation tracking, and fiber optic sensors. This basic component development leads to enhanced performance, increased reliability, and reduced size and cost for a large range of applications. FY 1982 Accomplishments: Project highlights include first demonstration of a high average power laser and a high pulse power tunable laser for search and countermeasure against optically aided threats; a high power waveguide carbon dioxide laser and a high operating temperature detector for reliable laser radar operation; and detector focal plane array processing significantly increasing detection sensitivity and permitting automatic target tracking. In addition, advances were made in demonstration of an all solid state light modulator for missile correlation tracking, a solid state ultraviolet detector for solar blind detection and horizon sensing in a satellite, and a single, compact chemical laser that lases over a large spectral region for countermeasures to most heat seeking missiles. FY 1983 Program: Highlights include the initiation of development of near-infrared and mid-infrared medium power lasers for sensor killer countermeasures and an all solid state, tunable, lower power infrared laser for a small, long life, reliable countermeasure source. The first demonstration of an all-optical bistable device for ultra high speed switching and sorting signal processing, a high brightness, compact diode pumped fiber optic laser for fiber optic sensors and signal processing, and low cross section mid-infrared detectors for improved stealth will be accomplished. Also, a low cost, high dynamic range fiber optic gyro will be demonstrated for strap down missile guidance. FY 1984 Planned Program: Project will complete development of an all solid state wavelength agile, near infrared laser for search against optically aided threats. Enhanced mercury-cadium-telluride 8 to 12 micrometer detectors and on-focal plane array signal processing to improve detection ranges and allow automatic target tracking will be demonstrated. Efforts to significantly increase the bandwidth of Bragg cells for spectrum analysis in threat warning systems will reach completion. The first near-infrared detector array with high speed and sensitivity for laser search systems will be demonstrated.

C. (U) Project 2002: Microwave Technology. This project develops the technology required to produce, control, and apply microwave and millimeter wave power. The scope of efforts includes theory, techniques, devices, and concepts at frequencies below 300 GHz. Areas of development are solid state sources and amplifiers, thermionic devices, power sensing and control, and phased array antenna techniques. System uses for this technology include radar, electronic countermeasures and communications. This technology development will increase reliability and performance, and reduce size and cost of components vital to a variety of microwave and millimeter wave systems. FY 1982 Accomplishments: Project advances were made in the state-of-the-art of solid state components, including field effect transistors IMPATT diodes, and gallium arsenide (GaAs) monolithic microwave integrated circuits. Among the achievements were higher power, extension of frequency coverage to millimeter wavelengths, performance and efficiency improvements sufficient to make system applications feasible, and fundamental reliability improvements. Breakthroughs in thermionic sources of millimeter wave power will provide a capability where none exists and be the basis of systems to counter new Soviet threats. Detectors, mixers, and other passive components were extended in frequency and improved in noise performance. FY 1983 Program: Project highlights include the initial demonstration of a 20-40 GHz millimeter wave power tube for electronic countermeasures transmitters and the development and demonstration of high power cross field amplifiers for uplink jammers. Development will continue on GaAs field effect transistors, which have become

C. (U) Project 2002: Microwave Technology (Continued).

key components in most microwave systems. 20 GHz GaAs IMPATT amplifiers having significant application potential in satellite downlink transmitters will be demonstrated. The demonstration of a 5-20 GHz antenna array will occur. Development will begin on millimeter wave transistors. FY 1984 Planned Program. This project will complete the development of high power GaAs IMPATT diodes at 40, 60, and 94 GHZ for satellite communications and missile seeker and terminal guidance applications. Initial feasibility demonstration of millimeter wave transistors will occur. Work will be initiated on the most promising thermionic approaches, explored in previous years, for generating power at 94 GHz for electronic countermeasure transmitters. High power, broad bandwidth monolithic microwave integrated circuits will be demonstrated. Solid state source and power combining efforts will continue with the goal of replacing tubes in radar, communication, and electronic countermeasure systems.

D. (U) Project 2003: Avionic System Design Technology. The objectives of this project include both advanced methods of designing, integrating and validating avionics systems and the facilities to simulate and evaluate such systems. The increasing use of embedded computers has created urgent needs for software support, while the high cost of testing places a premium on simulation techniques. This work produces both short term payoffs through improved design and acquisition of avionics software and longer term results as the basis for future integrated systems. In both cases, there is direct return on investment in the form of reduced life cycle costs, improved reliability, and easier upgrading of avionics suites. FY 1982 Accomplishments. Project highlights included the initiation of an effort to allow implementation of signal processing software in higher order languages to reduce costs and improve long term supportability. Work continued on development of advanced avionic system architectures to facilitate the exploitation of integrated avionics for increased mission effectiveness and availability. Effort continued on the development of techniques to improve the testing and maintenance of avionics systems. FY 1983 Program. The project will begin development of simulation facilities for the avionics suite for an unconstrained tactical fighter and on a fiber optic multiplexing system to provide the high data rates needed in integrated avionics architectures. Work will be completed on an effort to advance head-up display technology to the performance level needed by the next tactical fighter. Work will continue on design of fault- and damage-tolerant avionics configurations. Activities will begin in the conceptual demonstrations of advanced situation awareness and crew function automation technologies, as well as in the evolution of a generalized crew station capability to support these technology demonstrations. FY 1984 Planned Program. This project will complete development of a graphics generator brassboard and fiber optic multiplexing scheme for advanced cockpit displays as part of an integrated avionics suite. Work will continue on software techniques for avionics data processors and on simulation techniques to evaluate new concepts and components. Conceptual designs for advanced situation awareness and crew function automation technologies will be completed, and brassboard implementation will commence. In addition, the generalized crew station will be completed and will be applied to several validation activities.

E. (U) Project 2004: Technology for Reconnaissance and Targeting Avionics. The objective of this project is to provide the basis for major advances in electro-optical and infrared systems for real-time reconnaissance, automated target classification and aircraft navigation and defense. Efforts include techniques for target pattern recognition,

E. (U) Project 2004: Technology for Reconnaissance and Targeting Avionics (Continued).

advanced sensors and signal processors, and extension of existing forward-looking infrared systems to higher resolution and multiple functions. This work is essential to support both tactical and strategic aircraft able to cope with high densities of targets and defenses and to achieve multiple kills per sortie against a numerically superior enemy. FY 1982 Accomplishments. The ability to perform forward looking, laser illuminated, target classification utilizing three dimensional information was demonstrated. Progress continued in developing improved electro-optical and automatic target classification techniques ensuring the capability to perform rapid, multiple-kill per pass strike in increasing weather and countermeasure environments. FY 1983 Program. Project highlights include completion of data analysis under the forward looking active classification technology project to establishe techniques for automated targeting with infrared sensors. The second phase of a laser radar technology development program will be completed which established the technology base for a new generation of infrared acquisition and tracking systems. Multiple band staring infrared sensor work will proceed with demonstration of highly sensitive, dense staring arrays. The multiple function infrared sensor program will be initiated to demonstrate feasibility of a single sensor simultaneously accomplishing real time automatic targeting, and automatic or manual terrain clearance functions. FY 1984 Planned Program. Project will complete the fabrication phase of a laser sensor development and begin testing under simulated flight conditions. Work will be initiated building on prior laser target classification techniques, to demonstrate a capability to perform automatic real time target recognition.

F. (U) Project 6095. Inertial Reference and Guidance Technology. The objectives of this project are to improve the accuracy of inertial navigation systems as needed for cruise missile and tactical strike weapons and to develop low cost, mass-produced components for high volume applications such as tactical missiles and transport aircraft. The work includes ultra high precision accelerometers and gyroscopes, low cost molded thermoplastic inertial components, and mathematical techniques for error compensation. This work is essential both to permit advanced strategic and tactical weapon systems to be built and to address the unacceptably high cost of present moderate-performance inertial navigation systems. FY 1982 Accomplishments. Progress included brassboard demonstrations of high precision ring laser gyroscopes for advanced cruise missiles and tactical fighters. Work continued on low cost molded inertial gyro and accelerometer technology to further extend cost savings previously established. The feasibility of obtaining precise time from a ring laser gyro established. This effort has the potential to provide the Air Force with a low cost, precise time reference for multiple applications. A low cost accelerometer ($500 per axis) was fabricated and tested with excellent potential demonstrated for high accuracy applications. FY 1983 Program. Highlights include continuation of a real-time gravity compensation demonstration. This is essential to remove an error source which prevents current inertial navigation systems from providing accurate velocity information needed by advanced cruise missiles and synthetic aperature radar sensors. Molded inertial sensor work will be completed with the transition of molded thermoplastic technology designs of gyroscopes and accelerometers to various inertial instrument manufacturers. Development will also continue on high accuracy accelometers, and a multi-function radio navigation receiver using frequency domain processing for a low cost, high performance integrated communication/navigation/identification receiver. FY 1984 Planned Program. Project will begin flight test of the gravity error correction

F. (U) Project 6095: Inertial Reference and Guidance Technology (Continued).

techniques developed. Assessment of the multi-function radio navigation receiver using frequency domain signal processing will be completed and the results fed into advanced development projects. A high accuracy accelerometer brassboard will be demonstrated and transitioned to advanced projects. An effort will be initiated to more effectively integrate navigation-reference data for next generation avionics suites for reduced pilot workload in a low altitude environment.

G. (U) Project 6096: Microelectronics Technology: This project exploits selected solid state device and circuit technologies to achieve advances in information processing capacity, reliability, and radiation hardness. Work includes both advanced devices and materials, such as large scale gallium arsenide integrated circuits, and basic problems of packaging, testing, and design techniques needed to reduce cost and improve reliability in existing technology. The project is structured to complement developments in industry and other government laboratories by pursuing technologies not supported elsewhere. System payoffs include ultra fast front end data processors for real time surveillance systems; reduced size, weight, and cost of conventional microelectronic components; and tremendous expansion of data storage capacity in avionics systems. FY 1982 Accomplishments. Highlights include the following: Gallium arsenide integrated circuit fabrication process improvements have now demonstrated acceptable control of fabrication process parameters. This was evidenced by the demonstration of a nearly gigasample per second analog to digital convertor and initiation of a technology development of a very high speed integrated circuit for application to electronic warfare front end processing. Magnetic bubble materials were enhanced to assure a capability for building mass memories that will operate over the full military temperature range of -55°C to +125°C. A radiation hardened emulating computer which will process multiple instruction sets was demonstrated. Versions of this computer are in competition for application to Global Position System user equipment and are being considered for MILSTAR. A multi-level metal fabrication process was demonstrated in a multiple access memory device was adopted for use under the Very High Speed Integrated Circuits (VHSIC) program. FY 1983 Program. Project highlights include the following: A high density magnetic bubble memory systems development was initiated for full military temperature range applications. The application of gallium arsenide integrated circuit technology for use in Electromagnetic Warfare applications will be investigated. The development of multiple access memory devices for applications such as radar will be completed. An in-house evaluation of computer aided design methodologies developed under VHSIC will be demonstrated. A program to fabricate a very large scale integrated (VLSI) circuit which performs an image preprocessing function for weapons delivery systems applications will be initiated. This image processing function was developed, and design verified under a 1981 in-house program, and a Government patent application has been filed. FY 1984 Planned Program. Efforts initiated in FY83 will continue. Development of computer aided design (CAD) tools suitable for use with Gallium Arsenide technology will begin. These tools will address such problems as real-time iterative simulation and automat layout of microwave circuits. In-house efforts will address methods of simplifying and [illegible] ing the circuitry required for image processing.

H. Project 7622: All-Weather Reconnaissance/Strike Avionics. The objective of this project is new techniques and systems for aircraft radars, including synthetic aperture radar for imaging and [illegible]

Program Element: #62204F Title: Aerospace Avionics
DOD Mission Area: #521 - Electronics and Physical Sciences (ED) Budget Activity: #1 - Technology Base

H. Project 7622: All-Weather Reconnaissance/Strike Avionics (Continued).

automatic target classification. This work complements the electro-optical sensor project in addressing the full spectrum of detection/classification sensors. Work includes an in-house signal processing laboratory, a unique flying spectrum testbed for synthetic aperture radar testing, and new counter-countermeasures to allow radar to defeat enemy electronic defenses. The project is essential to support next-generation penetrating attack aircraft, air superiority fighters, and covert (stealthy) operations which require minimized emissions to reduce detectability. FY 1982 Accomplishments: Project highlights included the initiation of an effort to establish a target and background data base for bistatic radar. This is an essential step in development of bistatic radar for covert target acquisition and strike. An effort was started to develop electronic counter-countermeasure techniques against sophisticated agile jammer threats. Efforts were initiated to develop an automatic target classifier using synthetic aperture radar imagery. FY 1983 Program. The automatic synthetic aperture radar target classifier will be demonstrated that is able to distinguish tracked from wheeled vehicles. The upgraded synthetic aperture radar flying test bed will be used to collect data needed to specify design parameters for an attack aircraft used in an advanced development program demonstrating the use of bistatic synthetic aperture radar for increased covertness. FY 1984 Planned Program. Project will initiate efforts to identify efficient algorithms and architectures for future real time radar signal processors that accomplish automatic target detection and classification. The bistatic radar technology data base program will be completed and the information transferred to the Covert Strike advanced development program.

I. (U) Project 7629: Fire Control Avionics. This project develops new techniques for delivery of air-to-air and air-to-ground munitions and space weapons through integration of sensors, new fire control algorithms, and automation. Areas of work include expanded envelopes for missile and gun firing, automated battle management, and improved multiple target attack algorithms. Mission payoffs include higher weapon kill probability, multiple target attack, and improved survivability through firing range extension and evasive maneuvers. The effort is integrated with advanced sensor work under other projects. FY 1982 Accomplishments. Algorithms developed previously for an all-aspect gunsight, more effective missile launch envelope computations and display, and coupled fire control to flight control techniques were validated. Studies were completed defining the requirements for a space-based weapon fire control system. Advanced avionics strike configurations were generated for advanced weapons being developed by the Air Force Armament Laboratory. FY 1983 Program. The electro-optical threat sensor program effort will be completed. This effort is jointly conducted by the Avionics Laboratory, Air Force Weapons Laboratory and the Army Missile Command to address the common need for rapid, high volume search and multiple target tracking required for a point defense system against optical tracking and weapon guidance systems. Studies will be available on the high technology areas which will impact the next generation air superiority fighter fire control system and requirements for self defense of a space-borne weapon platform. Work will begin on a sensor integration scheme to couple aircraft sensors and flight controls for extremely low level penetration of enemy defenses and on new techniques and software for battle management, including multiple target attack. An in-house design for coupling a synthetic aperture radar with the aircraft

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Program Element: #62204F Title: Aerospace Avionics
DOD Mission Area: #521 - Electronics and Physical Sciences (ED) Budget Activity: #1 - Technology Base

I. (U) Project 7629: Fire Control Avionics (Continued).

flight control to enchance survivability while attacking dispersed multiple targets will be provided to industry. FY 1984 Planned Program. The project will assess, via a man-in-the-loop simulation, air-to-air battle management software for attacking multiple targets and the avionic specification/fire control software for a self defense weapon for a penetrating aircraft. Work will continue on weapon delivery and penetration requirements which are compatible with low observable airframes which meet the postulated threats for the next decade.

J. Project 7633: Passive Electronic Countermeasures: The objective of this project is to increase aircraft survival by improved threat warning, exploitation of captured foreign defensive systems, reduction in aircraft detectability, [

] FY 1982 Accomplishments. [

] FY 1983 Program. [

] FY 1984 Planned Program. [

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K. (U) Project 7662. Avionic Data Transmission and Reception. The objectives of this project are to develop improved methods for rapid information transmission to and from aircraft. Required capabilities include real-time transmission of imagery from reconnaissance platforms and secure, jam-resistant communications. This work includes signal processing techniques, image compression for reduced data rates, demonstration of jam-resistant hardware, and airborne laser communications. The mission payoff includes the ability of the battle commander to receive intelligence in near-real-time and the ability of aircraft to communicate and coordinate activities in the presence of sophisticated enemy jamming. FY 1982 Accomplishments. Project highlights included initiation of an adaptive interference cancellation development to address problems of incompatibility and self-jamming being experienced with

K. (U) Project 7662. Avionic Data Transmission and Reception (Continued).

current radio equipment. Design of a laser-based airborne optical communication system for secure, high capacity information transmission between aircraft was started. Work will continue on spread spectrum and frequency hopping techinques for secure data links and communications network. Improved imagery transmission and reception was demonstrated using advanced coding techniques, improving our ability to transmit real time reconnaissance information in hostile threat environments. FY 1983 Program. This project will demonstrate in brassboard form an agile transversal filter which will be a key factor in implementing communication links which are secure against interception and jamming. Work will begin on systems exploiting advanced microelectronic components to improve performance and reliability while reducing size and power consumption. Efforts on implementing signal processing and data link control software in higher order languages to reduce costs and improve long-term supportability will begin. FY 1984 Planned Program. A jam resistant modem for extremely wideband data links will be demonstrated. Results of the adaptive interference rejection effort will be evaluated, and the preferred approach will be transitioned to advanced development. Work will continue on methods of encoding data transmission for jam-and-interception-resistant communications.

8. (U) Project 06AA, Laboratory Operations (PROJECT OVER $10M IN FY 1984).

A. (U) Project Description. This project provides for the support activities required to operate the Avionics Laboratory, Wright-Patterson Air Force Base OH. The Avionics Laboratory is responsible for research, exploratory and advanced development programs concerned with navigation and guidance, weapon delivery and fire control, reconnaissance and aerospace surveillance, aerospaceborne communications, electronic countermeasures, avionic systems architecture and integration, and electronic and electro-optical device technology. The laboratory provides technical support to current and future systems programs and undertakes operational support projects in its mission areas. This project provides for the pay and related costs of civilian scientists, engineers, and support personnel; travel; transportation of equipment; rental equipment; communications and utilities cost; procurement of supplies and equipment; duplication and reproduction services; and contractor support services for maintenance and modification of facilities.

B. (U) Program Accomplishments and Future Efforts. Not Applicable.

C. (U) Major Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: 62205F — Title: Training and Simulation Technology
DOD Mission Area: #522 - Environmental and Life Sciences (ED) — Budget Activity: #1 - Technology Base

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	14,184	17,000	22,477	23,327	Continuing	Not Applicable
06HT	Laboratory Support	5,029	5,915*	6,458	6,568		
1121	Technical/Team Performance Training	1,345	2,233	2,500	2,605		
1123	Flying Training Development	1,000	1,174	1,925	1,995		
1192	Advanced Simulator for Pilot Training	4,697	4,472	5,750	5,980		
1710	Weapon Systems Logistics & Combat Maintenance	1,700	2,341	4,124	4,319		
6114	Simulation Techniques for Air Force Training	413	865	1,720	1,860		

*Excludes 1 Oct 82 civilian pay raise.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program will improve operational readiness through more effective training and increased weapon system supportability. It consists of efforts falling under the following Congressional categories: SIMULATION and TRAINING DEVICES, EDUCATION and TRAINING, and HUMAN FACTORS, as well as the general area of Logistics Systems Research. Significant opportunities exist for improving flying and technical training effectiveness with flight and maintenance simulators. A major research area concerning flight simulation uses the Advanced Simulator for Pilot Training (ASPT), a large field-of-view visual flight simulator. This simulator and related devices are used to conduct research to develop innovative methods for flight simulator training in general, to define hardware training effectiveness requirements, and to develop innovative techniques for training tactics used in air-to-ground, and air-to-air combat. Improved flight simulator hardware is also being developed to support these training research requirements. Another major research area investigates techniques for making maintenance and technical training more cost effective by developing and evaluating maintenance training simulators. These devices permit the simulation of malfunctions and allow hands-on maintenance training and trouble-shooting to take place without tying up or damaging expensive operational hardware. Computer based instructional technologies for technical training are also being developed in this research area. A third major research area concerns the logistics support of weapon systems and improvements that can be made by determining the interactions between the human elements of logistics and the associated characteristics of weapon systems. For example, a unified data base for emerging weapon systems will be

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2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: (Cont.)
designed to replace the multiple redundant and confusing data bases currently being used. This will allow designers highly consistent and accurate information for use in design trade-off studies. A fourth research area concerns crew, group, team, and unit performance and training and will concentrate on Command and Control (C^2) decision making systems used in the NATO environment.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
RDT&E	13,964	18,545	18,271		Continuing	N/A

The FY 1984 estimate was increased to provide for R&D efforts in the recently developed areas of logistics systems research and command and control team training, as well as expanded efforts in critically needed flight simulation R&D and technical computer based training.

4. (U) OTHER APPROPRIATION FUNDS: Not applicable.

5. (U) RELATED ACTIVITIES: The majority of the work is directly in support of requirements identified by major commands, Air Staff agencies, and separate operating agencies. Related efforts of the military services are identified in the Training and Personnel Technology Area Description. Related program elements are: 61102F, Defense Research Sciences; 62202F, Aerospace Biotechnology; 63106F, Logistics R&D Requirements; 63227F, Advanced Simulator Technology; 63751F, Innovations in Education and Training; 64227F, Flight Simulator Development; 62757N, Human Factors and Simulation Technology; 63733N, Training Devices Technology; 63720N, Education and Training; 62722A, Manpower, Personnel, and Training; 62727A, Non-System Training Devices Technology; and 63216A, Synthetic Flight Simulators. The Laboratory has several formal agreements that specify coordinated support to be provided by AFHRL and other agencies. These agreements include memoranda of agreement with the Army Program Manager for Training Devices for visual display light valve projector technology development; Tactical Air Command for flying training R&D and to help develop flight training schedules using Advanced Instructional System (AIS) software; Aeronautical Systems Division to coordinate simulator research and development with the Simulator Program Office and the Engineering Support Division; the Army and Navy to share development of a computerized instruction system; and with the Air Force Aerospace Medical Research Laboratory and Rome Air Development Center to share research products related to command and control systems. The Navy has a liaison office with the Laboratory's Operations & Training Division at Williams Air Force Base AZ. In addition, personal contacts, meetings, and formal contacts such as the DoD Technical Advisory Groups provide coordination between specific focal points for research and development efforts. Close coordination within the Air Force user community is also ensured by semiannual research and development coordination meetings between AFHRL, the Aeronautical Systems Division, and the major commands (TAC, SAC, MAC, ATC).

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6. (U) WORK PERFORMED BY: The program is managed by the Air Force Human Resources Laboratory (AFHRL), Brooks AFB TX. Three Laboratory divisions support this program element: Logistics and Human Factors, Wright-Patterson Air Force Base OH, Operations and Training, Williams Air Force Base AZ, and Training Systems, Lowry AFB CO. The Logistics and Human Factors Division is collocated with the Air Force Logistics Command, the Simulator Systems Program Office, and numerous other Air Force Laboratories and System Program Offices at Wright-Patterson Air Force Base OH. The Training Systems Division is collocated with the Air Training Command Technical Training Center at Lowry Air Force Base CO. The Operations and Training Division is collocated with Air Training Command and Tactical Air Command pilot training operations at Williams Air Force Base AZ. The Operations and Training Division also has convenient access to Tactical Air Command pilot training at Luke and Davis Monthan Air Force Bases AZ. The major contract efforts in FY 1982 were conducted by the following companies: McDonnell-Douglas, St. Louis MO (Project 1121); Systems Engineering Laboratories, Ft. Lauderdale FL (Project 1192); General Electric, Daytona Beach FL (Project 1192); Singer, Binghamton NY (Project 1192); and University of Dayton, Dayton OH (Projects 06HT and 1123). The total FY 1982 contract program ($9.083 million) includes 31 contractors.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 06HT, Laboratory Support. This project provides for part of the operation of the Air Force Human Resources Laboratory, Brooks Air Force Base TX, including pay and related costs of civilian scientists and support personnel, travel, transportation, rent, communications, maintenance, procurement of supplies and equipment, and contractor support services. The laboratory performs research and development in manpower and force management, weapon systems logistics, maintenance and technical training, and air combat tactics and training in support of immediate or potential needs of Air Force operational systems. This project supports and complements all projects in this program element.

B. Project: 1121, Technical/Team Performance and Training. There is a continuing Air Force need to reduce the cost of technical training while maintaining or increasing training quality and its ability to effectively and efficiently train a wide range of personnel. This project will improve the effectiveness of technical training and reduce the cost by developing and applying new training methods, techniques and devices. The emphasis will be on the application of computerized instruction and management systems, the development of individualized learning techniques, the use of new and improved instructional media and the development of maintenance trainers. In FY 1982, a computer-based instructional system was developed utilizing 3-dimensional graphics, and prototype 3-D computer-graphic videotapes were delivered to TAC. These simulation training tapes will be used to train weapons directors at TAC's Interceptor Weapons School. Evaluation of the training and cost effectiveness of the F-16 Simulated Aircraft Maintenance Trainers were completed. Development continued on the functional specifications for a Non-Destructive Inspection (NDI) maintenance trainer. In FY 1983, development efforts will concentrate on the instructor skills required in the Computer Based Instructional (CBI) environment, and the solution of many of the new problems being encountered. There are currently critical shortfalls in instructor personnel available for conventional instruction, and the widespread application of CBI techniques to solve these problems is rapidly approaching. However, new problems are encountered in the application of CBI technology and new instructional technologies must be developed. In FY 1983, the behavioral and engineering technology required to measure and improve team/crew performance will also be defined and improved team training procedures will be developed. In FY 1984 the conversion of the Advanced Instructional System (AIS) software to a standard computer language format will be completed, allowing the transfer of this

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B. Project: 1121, Technical/Team Performance and Training. (Cont.) technology to meet a broad range of computer-based instructional needs. Development will begin on decision and training guides for commanders of command and control systems. Work to improve the quality and timeliness of technical training will be conducted. Developmental work will also be conducted to standardize a CBI system across all three services, for reduced cost and best performance.

C. Project: 1123, Flying Training Development. There is a continuing Air Force need to reduce the cost of all types of flying training while maintaining or improving the quality and the ability to effectively and efficiently train aircrew personnel. This project applies new methods, techniques, and devices to the training and performance assessment of aircrews, with an emphasis on increased proficiency during transition and continuation flying training. In FY 1982, research was performed using a new high threat environment on the Advanced Simulator for Pilot Training (ASPT) that used seven independent Surface-to-Air Missile (SAM) sites (three SA4's, two SA6's) and nine Antiaircraft Artillery (AAA) sites (ZSU-23). This interactive environment exists with either the A-10 or F-16 cockpits and potential targets include a tank formation, communications vehicles, and a Soviet airport. Research was also performed using a micro-computer based special function trainer that provided part task training for F-16 weapons control tasks. A Radar Warning Receiver (RWR) trainer was also developed by combining micro-computer technology with color graphic displays. TAC BRAWLER, a value-driven math model of air combat, was used to evaluate the effects of visual system resolution, target contrast, and field of view upon the topography of selected one versus one and two versus one air-to-air engagements. This modeling approach addresses the potential impacts of alternative engineering design decisions upon the capability of a flight simulator to support certian types of task performance and the results will have significant impact upon the specifications for simulators used for air combat maneuvering training. In FY 1983, a method for obtaining accurate performance data on Tactical Air Command pilots flying Air Combat Maneuvering Range (ACMR) engagements will be implemented and evaluated. Transfer of training studies will continue to be conducted from flight simulator combat mission training in the Advanced Simultor for Pilot Training (ASPT) to aircraft missions at Red Flag. An evaluation will be performed on the contribution of part task trainers to Radar Warning Receiver system operations of TAC pilots. In FY 1984, efforts to develop performance measures of electronic combat capabilities for both SAC and TAC will continue. Additional efforts will concentrate on determining the operational training effectiveness of the B-52/KC-135 Weapons System Trainer. Assistance will be given MAC in the development and evaluation of continuation training programs for aerial refueling and the C-130 Weapon System Trainer (WST). An aircrew training management information system for TAC will be installed and field tested at Luke Air Force Base AZ. A breadboard helmet-mounted visual display system to portray high threat environments for realistic air combat training will be evaluated. The system will provide visual effects similar to the current wide field-of-view devices at much lower cost. A method for integrating measurements of pilot performance will be developed for use in the Simulator for Air-to-Air Combat. Transfer of training studies will continue from the Advanced Simulator for Pilot Training to Red Flag aircraft sorties using simulated hostile threat environments. In the future, increased research efforts on simulator training effectiveness will continue. The improvement of aircrew training will continue by increasing the realism of simulated advanced radar and other sensor system displays, and defining the hardware training effectiveness requirements. The enhancement of pilots' capabilities during hostile engagements will be pursued by developing a program for specialized training in tactical decision making. There will be an increased effort on combat tactics system development and visual scene studies to determine the effects of high resolution areas of interest and target insetting on aircrew performance.

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D. Project: 1192, Advanced Simulator for Pilot Training. This project provides for the operation and maintenance of the Advanced Simulator for Pilot Training (ASPT). This simulator system is the main research device for engineering and training effectiveness research. Most of the related research conducted under Project 1123, Flying Training Development, and Project 6114, Simulation Techniques for Air Force Training, is conducted on the ASPT or its related simulation subsystems. This Advanced Simulator for Pilot Training is thus the primary simulation device for implementing, demonstrating, and testing any simulation hardware or training technology advances which are developed under Projects 1123 or 6114. The ASPT is also used for demonstrating and testing engineering and training simulation technology advances which are developed under the related ASD and triservice program elements listed under related activities. Many plans and accomplishments supported by Project 1192 are discussed under Projects 1123 and 6114 which are supported by this Project. In FY 1982, Project 1192 provided for the operation and maintenance of the ASPT. In prior years, this project had already provided the main support for converting the original dual cockpit T-37 aircraft (ATC trainer) Advanced Simulator for Undergraduate Pilot Training (ASUPT) into the A-10 and F-16 (TAC aircraft) Advanced Simulator for Pilot Training (ASPT). In FY 1982, demonstrations and training evaluations were conducted on a single channel prototype dual light valve system. This system optically inserts miniraster (target) displays into lower resolution background scenes. In FY 1983, the operation and maintenance of the ASPT will continue. Demonstration and training effectiveness evaluations will be conducted on a dual mini-cathode-ray-tube helmet mounted display. The simulation support for related research projects will continue. This research will include transfer of training studies from the ASPT to Red Flag aircraft sorties and training effectiveness studies for visual flight simulation. In FY 1984, the operation and maintenance of the ASPT will continue. The research simulation support for related research projects will continue, including the tactical air combat transfer of training studies and visual flight simulation studies. Research studies will also be conducted to evaluate the potential of using a helmet mounted visual display to adequately portray a high threat combat environment. Investigation of the field of view, intensity, resolution, and color imagery for helmet mounted video displays will be conducted to identify possible alternatives for costly wrap-around mosaic CRTs or dome based visual systems. Investigations of the payoff for portability over conventional systems will be explored. The system will be extended into the simulation for radar imagery, low light level TV, and forward looking infrared (FLIR) imagery by placing special emphasis on exploiting the use of non-edge, non-linear methods for terrain representation. Studies of display technologies will be initiated for application to low cost visual displays. In the future, the ASPT will be integrated with the Advanced Visual Technology System (Project 2363, PE 63227F). This will permit improved training effectiveness for tactical training evaluation utilizing F-16 pilots. This will also provide a full mission, low altitude, adverse weather environment. With the integration of the B-52 WST sensor simulator capabilities, a full sensor simulation for tactical research will be available. The simulation support for related research projects will continue, including transfer of training studies, visual and sensor systems requirements studies, and strategic mission simulation studies.

E. Project: 1710, Weapon Systems Logistics and Combat Maintenance. The Air Force must improve the design of aerospace systems, reduce training and personnel problems associated with advanced systems, and insure that operational readiness is maintained at a high level. This project will provide new techniques to gather and incorporate human resources data into the design of new weapons, investigate and improve the efficiency of Air Force maintenance, and develop new concepts to solve critical logistics, manpower and training problems associated with new weapon systems. In FY 1982, work continued on a Unified Data Base (UDB) structure designed to evolve with a weapon system. This UDB will provide logistics planners an improved capability for considering both supportability and human considerations in design trade-off decisions. A three-year research effort was begun in logistic factors and training technology to upgrade combat maintenance capabilities and performance through better diagnostics, technical data, and team training methods. During the conceptual design of new avionics, logistics considerations have had insufficient influence; research was inaugurated to provide a feedback mechanism

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E. Project: 1710, Weapon Systems Logistics and Combat Maintenance. (Cont.) to design engineers which should lower support costs and increase system reliability. Excessive human decision errors are also causing high rates of unnecessary or inappropriate maintenance on today's complex weapons systems. A coordinated attack was begun on this problem to measure and eliminate sources of troubleshooting errors. Analysis of lessons learned from Israeli battle damage repair experience was completed. In FY 1983, work will continue to reduce high error rates in maintenance diagnostics. The prototype Unified Data Base of weapon system logistics information will be tested and demonstrated, and a supporting user's guide and maintenance handbook will be prepared. A program to develop, apply, and evaluate the logistics support concepts of maintainability, reliability, and survivability during the early conceptual design of avionics systems will be concluded. The capability will be refined to more accurately analyze, evaluate and predict the combat readiness of aircraft maintenance organizations. This will improve their ability to specify the personnel, training, management policies, and logistics support needed to achieve various degrees of mission readiness. High priority work will continue on identifying differences in how equipment fails in combat versus peacetime operation, and the implications for the maintenance tasks and resources that must be provided. Specific attention will be focused on electronic countermeasures equipment that is used by all services. Work will begin on an integrated methodology to predict the incidence of battle damage repair tasks and the training and resources required to sustain sortie generation in a high intensity war. Computer Aided Design (CAD) is now widely used in industry for design and development of weapon systems. Work will start to explore the feasibility of using a biomechanical model, a computer-generated model of a maintenance technician, to simulate and improve the ease of maintenance and support during computer aided design. Results should have a substantial impact on supportability and maintenance life cycle cost of future Air Force systems. In FY 1984, work will continue on improving maintenance diagnostics with the measurement of sources of diagnostic errors and the development of experimental diagnostic designs. Candidate corrective actions will be evaluated in terms of their effects on readiness and support costs. The tactical combat environment of the 1990s will require much greater dispersal of aircraft and support for survivability. Major efforts will be started to examine the implications of this dispersal on the maintenance tasks, training requirements, personnel classifications, and logistics support systems. New concepts and technology applications to cope with these impacts will be explored. In the future the methodology for assessing combat maintenance and logistics resource requirements will be demonstrated. A breadboard model of a portable, computer based aid for battle damage assessment will be developed. This aid will provide critical information on likely damage, repair requirements and flight capability impact for hits in specific sections of the airframe. The analysis of combat dispersal impacts on technology for effective logistics support will be completed. Tools and techniques designed to reduce maintenance diagnostic errors will be demonstrated.

F. Project: 6114, Simulation Techniques for Air Force Training. The Air Force must improve the quality and cost effectiveness of training by determining what types of simulator technology are most effective for specific training requirements. This project develops simulation hardware technology for future systems. These technologies will provide sufficient fidelity for aircrew training and weapon system mission exercise and assessment. In FY 1982 the technology required to link two simulators by fiber optics communications cables was accomplished. This link is the second step in the simulation of a complete low level combat scenario using multi-sensor displays. The initial development of a prototype fiber optic helmet mounted display for visual flight simulation was started. In FY 1983 the development of the helmet mounted display system will continue. Exploratory development efforts will continue on advanced computer image generation technologies and video-disc based visual image systems for visual and sensor displays. In FY 1984, subcomponent development will continue on the helmet-mounted display system for use in a transportable Combat Mission Trainer. The emphasis will be placed on reducing the size and weight of the helmet-mounted display system and developing improved head tracking systems.

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F. Project: 6114, Simulation Techniques for Air Force Training. (Cont.)
Efforts will also begin to develop videodisc microprocessor based part-task trainers for training cognitive and perceptual skills in aircraft systems management. These part task trainers will provide low cost alternative training systems to high cost full-mission simulators. In the future, the most promising hardware technology will be selected for the development of portable combat readiness training devices which can be taken into the field for training and mission rehearsal.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #62302F Title: Rocket Propulsion
DOD Mission Area: #523 - Engineering Technology (ED) Budget Activity: #1 - Technology Base

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Complet	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	34,515	37,072	35,210	41,154	Continuing	N/A
06RL	Laboratory Operations	11,660	11,857*	12,422	12,622		
2864	Interdisciplinary Space Tech	-	-	2,119	2,653		
3058	Space Propulsion Tech	6,893	8,670	7,331	9,180		
3059	Ballistic Missile Prop	4,218	5,623	4,946	6,194		
3148	Air-Launched Missile Prop	5,905	5,245	4,639	5,808		
5730	Multiple Application Tech	5,839	5,677	3,753	4,697		

* Excludes 1 Oct 82 civilian pay raise.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides new concepts and techniques in rocket propulsion and space technology to improve Air Force air-launched tactical and strategic missiles, space launch systems, satellites, and ballistic missiles. Provides technology with high performance payoff for solid propellant motors, liquid rocket engines, and electrical thrusters. Advanced missile propulsion concepts minimize the development risk to future Air Force missile, weapons, and in-space communications sytems.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

34,105	37,072	38,264	-	Continuing	N/A

FY 1984 reduction is a proportional decrease in scope across each project.

4. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

Military Construction Funds	0	0	5,400	0	N/A	N/A

5. (U) RELATED ACTIVITIES: Technology Base activities are related to National Aeronautics and Space Administration, Navy and Army programs. Coordination is accomplished through the Joint Army-Navy-NASA-Air Force Interagency Propulsion Committee, and through working level meetings and inter-service committees. This Exploratory Development program provides the technology base for PE 63302F, Advanced Missile Propulsion, and PE 63401F, Space Vehicle Subsystems.

6. (U) WORK PERFORMED BY: Air Force management of this effort is provided by the Air Force Rocket Propulsion Laboratory, Edwards Air Force Base, California and is accomplished through the management of contractual as well as comprehensive in-house efforts. The in-house efforts are conducted at numerous active experimentation areas and include motor testing, propellant formulation and sub- and full-scale mixing capabilities, and sea level and simulated altitude facilties to evaluate sub- and full-scale rocket propulsion systems and components. The top five contractors in FY 82 were Thiokol Corporation, Brigham City, UT and Huntsville, AL, (Projects 3058, 3059 and 5730); Hercules, Inc., Magna, UT (Projects 3058, 3059, 3148 and 5730); Rockwell Corporation, (Rocketdyne Division), Canoga Park, CA (Projects 3059 and 3058); Aerojet Strategic Propulsion Company, Sacramento, CA (Projects 3059 and 5730); and Chemical Systems Division, Sunnyvale, CA (Projects 3059, 3058 and 5730). There are 50 other firms with contracts totaling $17M.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: 2864 - Interdisciplinary Space Technology. This is a new project for FY 1984. The project focuses on the integration of multiple technical disciplines to produce technology which provides the link between key propulsion and non-propulsive components of space systems necessary to develop a total system. Areas of investigation include large space structure dynamics and system interaction control, thermal energy control, satellite autonomy, satellite contamination control and investigation of unique concepts for application to future space weapons. This project starts in FY 1984, consequently there are no FY 1982 achievements. A major FY 1984 milestone will be an extensive in-house laboratory demonstration of critical control theory (sensing and actuation) for active control of a fragile large space structure. Project new starts include investigation of methods for predicting satellite failures using ground station telemetry, development of highly sensitive (optical precision) structure control sensors and actuators, and the establishment of engineering principles for using critical reflectors as antennas and solar collectors.

B. (U) Project: 3058 - Space Propulsion Technology. This project will provide technology to assure access to space under routine operations and in times of crisis, to improve launch vehicle performance and to achieve a quick turn-around rapid response launch. Performance, durability and maneuvering are the critical areas being pursued in the satellite propulsion project to assure survivability of our space assets. Achievements in FY 1982 include the demonstration of durable, high performance thrusters that minimize plume contamination of the satellite, and the development of a new low cost titanium tankage fabrication method that results in a 50 percent reduction in satellite propellant tankage cost. Milestones in FY 1983-1984 will be a demonstration of plasma electric propulsion system (with a 300 percent increase in system life) and provide the initial feasibility demonstrations of compact cryogenic propellant toroidal tankage. Project new starts include development of reusable propulsion system components, investigation of advance regeneratively cooled combustion chambers, the development of solid propellants for space and the development of thermal control hardware to achieve long-term cryogenic fluids storage in space.

Program Element: #62302F Title: Rocket Propulsion
DOD Mission Area: #523 - Engineering Technology (ED) Budget Activity: #1 - Technology Base

C. (U) Project: 3059 - Ballistic Missile Propulsion. Future strategic forces must reflect a mix of characteristics that will enhance survivability. Chief among these characteristics is flexibility. Rocket propulsion technology options will reduce the development risk of future survivable, enduring strategic forces. Solid rocket motor technologies, when used in a small mobile ballistic missile, would provide a 30 percent increase in range or payload. This increased capability will be used for increased penetration aids or increase weapons delivery on target. Accomplishments during FY 1982 included the transition of technology to determine the useful service life of the M-X missile and the demonstration of the initial feasibility of an integrated stage concept to provide additional performance/energy in the same volume as a conventionally designed stage. Milestones in FY 1983-1984 include the development of an inert propellant to simulate mechanical properties of hazardous high energy propellants, the development of more efficient composite motor cases and the design of new high performance front-end propulsion systems for increased footprint (laydown) flexibility. Project new starts include a demonstration of a new lightweight radiation cooled cloth extendible exit cone, the development of glycidyl-azide polymer propellant for application to a small ICBM, and the development of a full-scale wound-in-place motor insulator.

D. (U) Project: 3148 - Air Launched Missile Propulsion. The propulsion technology in this project covers both strategic and tactical missile applications. Tactical missile propulsion technology is aimed at developing propellants that will provide no visible rocket plume signature and a very low infrared signature to minimize missile and aircraft detection by the enemy. Advanced air-launched strategic missile propulsion technology strives to maximize standoff range and provide a variable trajectory capability for a high kill probability and insure weapon penetration. A major achievement in FY 1982 was the successful firing of a high performance propellant, advanced composite case air-launched motor at a critical low temperature in the air-launched scenario (-65°F). This motor was structurally tested for both captive carry and launch loads. Milestones during FY 1983-1984 include accomplishing particle measurements in exhaust plume flow fields and the development of a propellant safe-life monitor. Project new starts include the development of stealth technology for motor cases, demonstration of advanced nozzles for air-launched missiles, and the development of a low cost anti-corrosion program.

E. (U) Project: 5730 - Multiple Applications Technology. This project includes those propulsion technologies which have many areas of application. These include understanding combustion mechanisms, propellant chemistry, solid propellant structural mechanics, and investigation of advanced propulsion concepts. Emphasis will be placed on defining those unique approaches that may be technology breakthroughs. This category includes solar and directed energy concepts as well as innovative conventional ways of providing weapon system capability improvements. Achievements in FY 1982 include the demonstration of a method to eliminate the destructive flow induced instabilities sometimes present in solid propellant motors and demonstration of a non-asbestos solid motor insulation. Milestones in FY 1983-1984 will be to demonstrate a long life, non-migrating internal solid propellant plasticizer and to accomplish an initial feasibility demonstration of a solar rocket. Project new starts include further investigation on solar rocket propulsion systems, investigation of a high thrust water fueled rocket, ballistic tailoring of minimum smoke solid propellants, and the development of solid propellant strain measurement techniques.

Program Element: #62302F　　　　　　Title: Rocket Propulsion
DOD Mission Area: #523 - Engineering Technology (ED)　　　　　　Budget Activity: #1 - Technology Base

8. (U) PROJECT: 06RL, Laboratory Operations (PROJECT OVER $10 MILLION IN FY 1984):

A. (U) Project Description: This is the only project in this program element that will exceed $10M in FY 1984. This project funds support activities required to conduct the technology programs and to operate the Air Force Rocket Propulsion Laboratory, Edwards Air Force Base, CA. The project provides an in-house program covering the following areas: rocket propulsion phenomenology investigations, new concepts feasibility, applications evaluations, and systems support to AFSC product divisions. It covers direct and related costs of civilian scientists, engineers and supporting personnel, transportation, rent, communications and utilities cost, procurement of supplies, equipment, and contractor support services.

B. (U) Program Accomplishments and Future Efforts: Not Applicable.

C. (U) Major Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #62601F — Title: Advanced Weapons
DOD Mission Area: #521, Electronics & Physical Sciences (ED) — Budget Activity: #1, Technology Base

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	39,650	44,452	45,714	47,740	Continuing	N/A
06WL	Laboratory Operations	13,742	15,083*	15,106	15,664		
1900	Environmental Quality Technology	1,700	1,700	1,800	2,000		
2007	Nuclear Safety	600	700	900	1,000		
2218	Laser Survivability/Vulnerability Technology	500	600	800	976		
2444	Integrated Computational Center	600	500				
2673	Civil Engineering Technology	500	1,600	1,600	700		
3326	Laser Applications	12,708	13,669	13,900	14,500		
5797	Advanced Weapons Concepts	3,770	4,600	5,300	6,200		
8809	Nuclear Vulnerability & Hardening Technology	5,530	6,000	6,308	6,700		

* Excludes 1 Oct 82 Civilian Pay Raise

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program develops the technology base for advanced weapons and their adaption to Air Force systems. Studies and experiments are conducted in laser applications, survivability/vulnerability, advanced weapon concepts, nuclear weapon environment, civil engineering technology, and environmental quality. Operation and maintenance of the Air Force Weapons Laboratory at Kirtland Air Force Base, NM, is also included.

3. (U) COMPARISON WITH FY 82 DESCRIPTIVE SUMMARY ($ in thousands):

RDT&E	39,208	44,471	44,691

Increase in funding in FY 1984 is for civilian pay raise and a tri-laboratory effort on civil engineering aspects of airbase survivability.

4. (U) OTHER APPROPRIATION FUNDS ($ in thousands):

Military Construction	6,800	0	0	3,697

Program Element: #62601F Title: Advanced Weapons
DOD Mission Area: #521, Electronics & Physical Sciences (ED) Budget Activity: #1, Technology Base

5. (U) RELATED ACTIVITIES: Nuclear weapons effects are closely coordinated wih programs funded by the Defense Nuclear Agency Program Element 62715H and the Defense Advanced Research Projects Agency Program Element 62301E. Technology developed through these programs directly supports increased nuclear survivability efforts for Advanced Strategic Missile Systems Program Element 63311F, and Air Force Systems Survivability (Nuclear Effects) Program Element 64711F. Exploratory laser development supports the Air Force Advanced Radiation Technology Program 63605F. Civil and environmental engineering technology efforts directly support the Civil and Environmental Engineering Technology Program Element 63723F.

6. (U) WORK PERFORMED BY: The Air Force Weapons Laboratory at Kirtland Air Force Base, NM, manages the majority of the work performed under this Program Element. The Engineering and Services Laboratory at Tyndall Air Force Base, FL, manages Project 1900, Environmental Quality Technology, and Project 2673, Civil Engineering Technology. Air Force Weapons Laboratory facilities involved in the work include the Impact Facility, Sandia Optical Range, the Laser Laboratory, the SHIVA Electromagnetic Implosion X-Ray Source, the Dipole and TRESTLE electromagnetic pulse simulators and the Civil Engineering Research Facility. Engineering and Services Laboratory facilities include the Environmental Chemistry Research Laboratory. The top five contractors and associated projects are TRW, Redondo Beach, CA (Project 3326); Rockwell Rocketdyne, Canoga Park, CA (Project 3326); Bell Aerospace, Buffalo, NY (Project 3326); RDA, Marina Del Ray, CA (Project 8809); K Tech Corp, Albuquerque, NM (Project 8809). The total number of contractors is 49 and the total dollar value of contracts is $30,146K.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project 1900, Environmental Quality Technology: Provides the exploratory development for addressing Air Force unique time-critical problems in environmental quality. The goal is to ensure compliance with environmental regulations so that readiness is maintained by allowing full deployment of new weapons systems and realistic and unimpeded peacetime training and operations. Accomplishments during FY 1982 included completion of a study on the effects of aircraft fuel dumping, with the study having a direct impact on fuel dumping policies and procedures in Europe. Emissions from an A-10 aircraft were measured using laser remote sensing at a distance of 2.7 km from the aircraft. Also accomplished was an investigation on absorption of trichloroethylene in soils. This has a significant impact on cleanup actions such as at Wurtsmith AFB. For FY 1983, methods for in-situ cleanup of toxic materials and technology for recovery and treatment of hazardous wastes will be investigated. A computer program will be developed to predict groundlevel toxic hazards resulting from the catastrophic reaction of hypergolic fuels. Continuing will be the characterization of the environmental chemistry and fate of production shale jet aircraft fuels. For FY 1984, techniques to suppress and control turbine engine smoke will be developed. The fate of toxic pollutants in Air Force treatment facilities will be assessed and development of a universal detector for toxics whose sensitivities are greater than threshold limit values will continue.

B. (U) Project 2007, Nuclear Safety: Develops the technology to perform nuclear safety analyses for nuclear weapon systems and Air Force aerospace systems carrying nuclear materials. Two computer codes were developed in FY 1982; one to analyze nuclear security and one to analyze nuclear safety. The latter was successfully applied to the MX and B-1B. A feasibility study for a nuclear weapon secure container was completed along with Technical Nuclear Safety Analyses (TNSAs). During FY 1983, TNSAs are likely to include the FB-111 Aircraft Monitor and Control (AMAC), B-52 AMAC, B-61, B-83, F-15, B-1B, W87, GLCM and MX. In-house R&D will involve improvements and state-of-the-art advances

Program Element: #62601F Title: Advanced Weapons
DOD Mission Area: #521, Electronics & Physical Sciences (ED) Budget Activity: #1, Technology Base

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: (Continued)

B. (U) Project 2007, Nuclear Safety: (Continued)

to safety and surety tools and update of the nuclear safety and design criteria handbook. Development of an integrated analytical tool to assess physical security of nuclear systems will be ongoing in FY 1984. Studies will be performed to develop detection and location aids for missing nuclear devices and to investigate lightweight armor for protection of nuclear weapons from terrorist gunfire attack.

C. (U) Project 2218, Laser Survivability/Vulnerability: Provides quantitative data to assess the survivability/vulnerability of US systems to laser radiation. During FY 1982, the development of methodology for satellite laser vulnerability assessments was completed, initial material testing at 3.8 micrometers wavelength was completed, and work was begun in space materials and components testing. The testing of space materials and components will continue in FY 1983 and will be completed in FY 1984. Material testing will also continue in FY 1983 and FY 1984, with emphasis on composite materials. Vulnerability analyses will continue for selected US systems, and a damaged satellite performance study will start in FY 1984.

D. (U) Project 2673, Civil Engineering Technology: Provides the Air Force with exploratory development in airbase survivability and runway performance enhancement. Without this effort, advanced/engineering development programs in airbase survivability, such as Rapid Runway Repair (RRR), would be restricted due to lack of basic technology development. Completed during FY 1982 was the laboratory and analytical study on soil reinforcement for contingency pavement systems. A laboratory effort to improve the water and temperature sensitivity of polymer concrete for airfield bomb damage repair was successfully completed and the proposed HEMA Acrylic will be used in the 6.3-6.4 RRR program. The blast absorbing structural systems study will be completed in FY 1983. Also to be completed is the load definition of conventional weapons on airbase structures along with the isolation of structural response mechanisms up to incipient collapse. This effort is part of a tri-laboratory effort to improve the technology base for civil engineering aspects of airbase survivability. In FY 1984, the study on response of internal equipment to structural damage will be completed along with development of a hyperbolic parabolic shell concept for survivable airbase structures. Relating to RRR, the Phase I study on damage resistent pavement will be completed and development will continue on a rapid concrete cutting concept for airfield bomb damage repair. Experimentation will begin on dynamic properties of hyper-strength portland cement for extremely hardened structures.

E. (U) Project 5797, Advanced Weapons Concepts: Prevents technological surprise by exploring new weapon concepts and applications. The bulk of this project involves identifying and developing the critical technologies for exoatmospheric (neutral) and endoatmospheric (charged) particle beam weapons. Included to a much smaller degree is the investigation of high power microwave weapons and nuclear weapon conceptual and feasibility studies. In FY 1982, development of the RADLAC II charged particle beam accelerator proceeded by completion of the module pulsed power tests. The Mark VIII Style magnetocumulative generator was successfully fired; the generator is a possible source of pulsed power for particle beam and microwave weapons. Nuclear weapon conceptual studies were performed for a SRAM replacement, the Advanced ICBM and a Tactical Air-to-Surface Munition. In FY 1983, the kill mechanisms of neutral beams against

Program Element: #62601F Title: Advanced Weapons
DOD Mission Area: #521, Electronics & Physical Sciences (ED) Budget Activity: #1, Technology Base

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: (Continued)

E. (U) Project 5797, Advanced Weapons Concepts: (Continued)

electronic components and small subsystems will be determined. Investigation of microwave weapon feasibility will continue with studies on coherent microwaves and development of diagnostics for the virtual cathode oscillator. The modification of a rocket reactor to provide up to 100 MW of prime power will also be studied. In FY 1984, key experiments will be defined for demonstration of atmospheric beam propagation with the RADLAC II accelerator. One plane beam sensing studies will be initiated for pointing and tracking of the exoatmospheric neutral beam. Lethality studies will quantify electronic kill mechanisms along with testing the effectiveness of proposed countermeasures.

F. (U) Project 8809, Nuclear Vulnerability and Hardening Technology: Develops the technology necessary for survivable aerospace weapon and C^3 systems along with a viable capability to perform nuclear effects analysis and simulation testing. During FY 1982 the Enewetak Atoll Seismic Investigation Study produced a breakthrough in understanding crater size and shape. Selection criteria studies for deep based systems were published. Criteria and/or hardening/survivability recommendations were developed for the B-52, B-1B and satellite communications links. A high altitude debris motion model and a multiburst capability were developed and incorporated into satellite threat codes to further define and analyze space nuclear environments. The x-ray simulation development device SHIVA II was successfully used for fast plasma implosion experiments. In FY 1983, criteria and hardening recommendations for the MILSTAR, MX and other systems will continue. Radiation testing of infrared and other electronic components will continue. The borehole shear device will be tested in-house. The device was developed to measure soil properties for use in nuclear survivability calculations. Assistance will be provided to the Nuclear Criteria Group and the national laboratories in an effort to redefine high altitude EMP criteria. The x-ray simulation devleopment device SHIVA Star will be fired at 6MJ and single implosion experiments will begin. During FY 1984, efforts to understand the nuclear survivability of a system throughout its life cycle will continue. Criteria development will be provided for those systems designated by the Nuclear Group Secretariat. Methods will be developed to harden and assess hardness of signal processors and very large-scale and very high-speed integrated circuits. Cratering and shock environments will be defined. SHIVA STAR will be upgraded to 9MJ at which time full-up fusion experiments will begin.

8. (U) PROJECT 06WL, AFWL OPERATIONS (PROJECT OVER $10 MILLION IN FY 1984):

A. (U) Project Description: This project provides for the support activities required to operate the Air Force Weapons Laboratory, Kirtland Air Force Base, NM. The Air Force Weapons Laboratory is responsible for exploratory, advanced, and engineering development programs associated with nuclear and other nonconventional advanced weapons, including studies of effective delivery techniques and hazards of these weapons. The Laboratory provides technical support to current and future systems programs and undertakes operational support efforts in its mission areas. This project provides for the pay and related costs of civilian scientists, engineers, and supporting personnel in the AFWL; travel and other transportation costs; costs for AFWL personnel training, facility projects, and communication lines; rental and maintenance costs for administrative equipment; nontechnical contractual services; and procurement of administrative supplies and equipment.

Program Element: # 62601F
DOD Mission Area: #521, Electronics & Physical Sciences (ED)

Title: Advanced Weapons
Budget Activity: #1, Technology Base

8. (U) Project 06WL, AFWL Operations (PROJECT OVER $10 MILLION IN FY 1984): (Continued)

B. (U) Program Accomplishments and Future Efforts: Not Applicable

C. (U) Major Milestones: Not Applicable

9. (U) Project 3326, Laser Applications (PROJECT OVER $10M IN FY 1984):

A. Project Description. This project provides exploratory development to establish the technical feasibility and operational practicability of lasers as weapons to fulfill specific Air Force mission requirements. Included in the scope of this project are the study of advanced laser device concepts[ ]the investigation of aerodynamic effects on airborne laser propagation, including flow control techniques to reduce aero-optical interaction; the analysis and investigation of advanced beam control concepts, including adaptive optics concepts and advanced resonator designs; diagnostic evaluation, modeling and kinetics studies for the hydrogen fluoride/deuterium fluoride chemical laser; the development of repetitively-pulsed deuterium fluoride chemical laser technology; material, component and fabrication technology development for high energy laser optical components; the investigation of high energy laser effects; and studies and analysis of potential applications of high energy laser systems.

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: The development of the oxygen-iodine chemical laser concept continued, with the demonstration of over 2 kW from a laboratory device. Also successfully demonstrated was continuous-wave lasing from an optically pumped iodine monofluoride laser, a significant step in developing the chemically pumped iodine monofluoride laser concept. Continuing research with the continuous-wave hydrogen fluoride/deuterium fluoride (HF/DF) chemical laser has improved the accuracy and scope of the kinetics data base for laser performance modeling, and a laser induced fluorescence diagnostic capability has been developed, improving the capability to evaluate in detail the performance of advanced nozzle concepts for HF/DF chemical laser devices. In pulsed HF/DF chemical lasers, in-house testing of a large, single pulsed device has successfully achieved its performance goal of[ ] For high energy laser optical components, the investigation and development of window materials for[ ]has been successful in demonstrating reproducible fabrication of optical quality calcium fluoride windows up to 28 cm in diameter. Application analysis for high energy laser systems has continued, and Phase I of a major airborne applications study was completed.

(2) FY 1983 Program: The investigation of advanced concepts will continue, and supporting efforts in effects/vulnerability, theoretical modeling, and applications analysis will be pursued. Particular emphasis will be placed on the development of the oxygen-iodine chemical laser system[

Program Element: # 62601F   Title: Advanced Weapons
DOD Mission Area: #521, Electronics & Physical Sciences (ED)   Budget Activity: #1, Technology Base

9. (U) Project 3326, Laser Applications (PROJECT OVER $10 MILLION IN FY 1984): (Continued)

(2) FY 1983 Program: (Continued)

Investigation of other new laser concepts will continue, including an attempt to demonstrate lasing from the chemically-pumped iodine monofluoride laser concept. For pulsed HF/DF chemical lasers, the in-house laser devices successfully developed and tested in FY 1982 will be used to conduct material effects and optical coating performance testing. Work will begin on the development of an advanced cooled deformable mirror [ ] in-house testing of advanced resonator concepts at low power will continue, active structural control concepts will be investigated, and an effort will begin to investigate shared resonator concepts with the promise of coupling several separate laser resonators together to produce a single high quality laser beam. Repetitively-pulsed laser testing will be conducted, and a satellite parametric study will be completed. Applications analysis will focus on airborne applications [ ] and a cost algorithm study will be completed.

(3) FY 1984 Planned Program: The evaluation of advanced laser device concepts will continue as promising candidates are investigated to establish performance and scalability [ ] The development of a [ ] oxygen-iodine chemical laser will continue; [ ] Building upon analysis and laboratory experiments in FY 1983, significant efforts will take place in the investigation and scaling of the chemically-pumped iodine monofluoride laser concept. Work with continuous wave HF/DF chemical lasers will continue with emphasis on improving modeling capabilities and on the modeling and evaluation of advanced nozzle concepts. The development of optical components will continue to emphasize components and coatings [ ] building upon prior work with calcium fluoride, an attempt will be made to scale the fabrication of mechanically strong, high quality calcium fluoride windows to 45 cm in diameter. Efforts investigating advanced deformable mirror technology will be completed, and an advanced cooled deformable mirror, begun in FY 1983, will be fabricated and delivered to AFWL for evaluation. Beam control system requirements for [ ] systems will be considered in greater detail, with continuing emphasis of advanced concepts and accurate modeling capability. A shared resonator study, begun in FY 1983, will lead to breadboard testing to demonstrate the feasibility of multiple resonator coupling to produce a single high quality laser beam. Airborne testing to determine the effects of aero-optical interactions will be completed and experimental results will be used to validate the performance of aerodynamic flow field models developed to analyze and predict aero-optical effects. Supporting work in phenomonology investigations and applications analysis will also continue, [ ]

(4) (U) Program to Completion: This is a continuing program.

C. (U) *Major Milestones:* *Not applicable.*

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #62602F
DOD Mission Area: #523, Engineering Technology (ED)

Title: Conventional Munitions
Budget Activity: #2, Technology Base

1. (U) RESOURCES (PROJECT LISTING): ($in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	33,234	37,402	40,833	43,651	Continuing	N/A
06AL	Air Force Armament Laboratory Operations	13,748	14,049*	14,573	14,785		
2068	Guided Weapons Technology & Simulation	6,936	7,200	7,830	7,925		
2502	Munitions, Dispensers, & Component Technology	4,860	6,793	7,000	9,548		
2543	Weapon Evaluation/Effects Methodology	3,083	3,140	3,160	3,737		
2560	Direct Fire Weapons Technology	3,031	3,448	3,700	3,819		
2567	Weapons Carriage and Release Technology	1,576	2,772	4,370	3,437		
2946	Chemical Warfare	-	**	200	400		

* Excludes 1 October 1982 civilian pay raise.
** Activity begins in FY 83 under Project 2543.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program establishes the Air Force technology base in conventional munitions to support tactical air-to-surface and air-to-air guided weapons development. This includes design and feasibility demonstration of advanced air-delivered munitions, including cluster munitions, warheads, fuzing, and target-activated munitions as well as development of new and improved weapon evaluation methodologies and their supporting data bases. Supports advancement of the state-of-the-art in aircraft guns, rockets, ammunition, ancillary support equipment, new propellants and explosives; development of effective stores management, aircraft/store interfacing techniques, and supporting system software; new techniques for predicting behavior of proposed aircraft/weapon configurations; and retaliatory offensive chemical standoff weapons. This program also provides funding for the operational support and management of the Air Force Armament Laboratory at Eglin Air Force Base, FL, support for the Joint Service Guidance and Control Committee (JSGCC), and fiscal support to the Guidance and Control Information Analysis Center (GACIAC).

Program Element: #62602F
DOD Mission Area: #523, Engineering Technology (ED)

Title: Conventional Munitions
Budget Activity: #2, Technology Base

DECLASSIFY ON: OADR

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	32,724	37,416	38,366		Continuing	N/A

Budget increase in FY 1984 represents expanded efforts in submunition technology, improved methods for drag reduction and stealthy characteristics for munitions, advanced guidance for air-to-air missiles, and retaliatory offensive standoff chemical weapons.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Costs
Military Construction		340	940	4,906		

5. (U) RELATED ACTIVITIES: This program supports, through advanced technology efforts and simulation, the following Program Elements: 63601F, Conventional Weapons; 63609F, Advanced Attack Weapons; 64602F, Armament/Ordinance Development; 63370/64416F, Advanced Medium Range Air-to-Air Missiles; 6460/F, Wide Area Anti-Armor Munitions; 64604F, Low Altitude Airfield Attack Systems; 64612F, Low Level Laser Guided Bomb; 64614F, Medium Range Air-to-Surface Missile; 64608F, Close Air Support Weapons Systems; 64610F, Air Delivered Land Mines; 63253F, PAVE PILLAR; 63219N, Advanced Aircraft Armament Systems; and 64746F, Expendable Drones. Related Army and Navy advanced technology efforts are coordinated through existing and specially established channels (62332N, Strike Warfare and 62303N, Missile Technology). Technology base efforts are reviewed by the Joint Directors of Laboratories Committee to coordinate related technologies and approaches. The Joint Logistics Commanders and its Joint Technical Coordinating Group for Munitions Development and Munitions Effectiveness provide an additional program coordination channel. There are special coordinating groups such as the Fuze Management Organization, the Under Secretary of Defense for Research and Engineering sponsored Joint Service Guidance and Control Committee, and the Terminally Guided Submunition Group for selected development efforts. These groups are structured to review, on a semi-annual basis, related activities to prevent duplication in related technology programs.

6. (U) WORKED PERFORMED BY: This program is managed by the Air Force Armament Laboratory, Eglin Air Force Base, FL. The Air Force Armament Laboratory has the following in-house facilities: Interior Ballistics Facility, Aeroballistics Research Facility, Ballistics Experimentation Facility, Gun Mechanisms Laboratory, Propellant Evaluation Facility, High Explosives Research and Development Facility, Armament Systems Integration Facility, Structural Dynamics Facility, Missile Simulation Laboratory, Radio Frequency Millimeter-Wave Laboratory, Laser and Optics Laboratory, Digital Image Processing Laboratory, Special Projects Laboratory, Electro-mechanical Fuze Laboratory, Sensor/Fuze Data Collection and Analysis Laboratory, Hopkinson Bar Facility, Computer and Graphics Analysis Laboratory, Environmental Research Laboratory, Technical Library and Model Shop. The work is performed by industrial contractors, educational institutions, DOD and DOE by contract and in-house. The top five contractors are: Lockheed Missile and Space Co., Sunnyvale CA (Projects 2502, 2068); General Dynamics, San Diego CA (Projects 2502, 2068); Rockwell International, Canoga Park CA (Project 2567); Orlando Technology, Orlanbo FL (Projects 2502, 2543); and Datatec Inc., Fort Walton Beach FL (Project 2543). There are 30 additional contractors with contracts totaling $10.3M.

Program Element: #62602F
DOD Mission Area: #523, Engineering Technology (ED)

Title: Conventional Munitions
Budget Activity: #2, Technology Base

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: 2068, Guided Weapons Technology and Simulation. This project provides the essential basis for accurate, flexible, affordable and effective missile guidance systems. It also develops simulation capabilities which allow development and evaluation of guidance concepts at low cost. Achievements in FY 1982 include major improvements in the data base used to support advanced missile seeker development, especially at millimeter wave frequencies; a new program to explore special components which will remove system constraints imposed by present circuitry; and demonstration of an infrared spatial light modulator which greatly enhances target identification in cluttered backgrounds. In FY 1983, efforts will continue to upgrade the guided weapons simulation and analysis capability of the Air Force Armament Laboratory. The aero load simulator will be modified to increase its speed of response and accuracy. In the area of aerodynamic technology, effort will continue to address augmented controls to provide small airframe time constants for tactical air-to-air missile configurations at transonic and supersonic mach numbers, moderate angles of attack and high altitudes. In the area of RF terminal guidance, emphasis will be directed to development of generic passive/active modeling of air-to-air RF seekers, autonomous RF target identification/classification, broadband radome fabrication/evaluation, advanced millimeter-wave antiarmor concepts, continuous wave processor technology for emitter homing applications, and synthetic aperture seeker technology for high value targets. Electro-optical terminal guidance will focus on IR parallel image processing, hybrid optical seeker and IR imaging seeker technology, and laser guidance for guided weapons. In FY 1984, development of a tactical guided weapons simulation capability to accommodate air-to-air and air-to-surface simulations will continue. Investigation of guided weapons integration technology to include extended medium range air-to-air technologies, aerodynamic prediction techniques, air-to-air missile integration synthesis and autopilot technology will continue. Investigation of low cost inertial navigation system technology to support air-to-air and air-to-surface missiles will be continued. The generic passive/active air-to-air RF terminal guidance simulation will be completed and available for evaluation of passive/active all-weather seeker technology. Defense suppression technology to be pursued will include antiradiation homing and related techniques for striking hostile defensive systems, signal sorting, and strapdown antenna developments. The synthetic aperture seeker system algorithm validation program will continue to provide high-value target guidance algorithms. Development of an image processing capability will be advanced. Electro-optical seeker technology, including a parallel image processor, a hybrid optical seeker and ladar seeker technology, will be pursued to upgrade the technology base for terminal guidance seekers. Improvements to the digital image processing facility will be completed.

B. (U) Project: 2502, Munitions, Dispensers, and Component Technology. This project develops the technology base for advanced air-delivered weapons, including cluster munition dispensers and submunitions, fuzes, stabilization/retardation devices, warheads, and computational methods for evaluating and improving munitions. In FY 1982, accomplishments included demonstrations of the effectiveness of the Bunkered Target Munition against hardened command and control facilities and of self-forging warheads against aircraft. Significant results were also obtained in depleted uranium and penetrating rod warheads, selectable pattern cluster munitions, and impact delay fuzes. In FY 1983, the project will continue vulnerability studies of enemy antiair weapon systems and determine an optimum defense suppression weapon concept that will satisfy long-term defense suppression requirements; continue to investigate and optimize the combination

Program Element: #62602F Title: Conventional Munitions
DOD Mission Area: #523, Engineering Technology (ED) Budget Activity: #2, Technology Base

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: (Continued.)

B. (U) Project: 2502, Munitions, Dispensers, and Component Technology. (Continued.)

of self-forging fragmentation technology with integral incendiaries to provide an effective submunition for defeat of diesel fuel targets; and test and evaluate kinetic energy penetrator cluster munition concepts and designs for penetration into buried/hardened command, control, and communications facilities. Studies will continue on blast enhancement and advanced kill mechanisms, fiber optic magnetometers, and characterization of aircraft target signatures. An in-house developed Airfield Denial Influence Fuze breadboard will be demonstrated. Development of instrumentation to measure hard target penetration deceleration will continue. A depth programmable penetration fuze and a programmable universal fuze for missiles will be initiated. In FY 1984, development of technology for modular dispenser systems with reduced weight and drag and with high payload to weight ratios will be pursued. Efforts will continue on warhead models, optimum defense suppression weapons, kinetic energy penertrator concepts for defeat of hardened targets, warheads to defeat aircraft and heavy armor, and improvement of materials models for hydrocode application to enable detailed understanding of the physics involved in the penetration and formation processes. Target signature modeling programs will be completed, and reprogrammable signal proccessor techniques will be demonstrated and made ready for advanced development. Work on a depth programmable fuze, multi-point warhead fuzing, and a fuze concept which corrects for the disturbances induced during stores release (referred to as a Performance Controlled Stores fuze) will continue.

C. (U) Project: 2543, Weapon Evaluation/Effects Methodology. This project addresses the requirement for computer simulation of the interactions between munitions and targets to permit timely and inexpensive evaluation of a broad range of warheads and structures. In FY 1982, simulation models were completed for fuzes and warheads applicable to MIG 21/23 aircraft for all-aspect gunnery, and for improved munition aerodynamic and trajectory analysis. Vulnerability and behavioral models for Soviet Flogger E/F, Fitter C, and Foxbat aircraft and for hardened high value targets were also accomplished. In FY 1983, end-game models, including fuze, warhead, and target descriptions will be developed for the AIM-7F with applications to the Backfire Bomber and the Soviet cruise missile. A computer program will be developed to assess the effectiveness of guided projectile concepts. Animated computer graphics will be developed for displaying and studying engagement and end-game kinematics. Small computer methods will be developed to further assist aircrews in all phases of mission planning. Continued effort will be applied to improved exterior ballistic flight performance predictive models, models for mobile SAM targets and support vehicles, and vulnerability assessments for these vehicles. Vulnerability models will be prepared for the Foxbat and another advanced Societ aircraft for use in warhead lethality evaluations. Sensitivity studies will be run for critical components of representative aircraft. Computerized target models of a radar site and a communications facility will be prepared. Explosive tests will be conducted inside a scaled model command center to establish blast migration through interior rooms. In FY 1984, computation, verification, and collection of weapons effectiveness indices, weapons characteristics, performance, delivery, accuracy, aircraft carriage options, and target information will continue. The capability to prescribe optimal recovery procedures following an airbase attack will be developed. Computer models will be updated or derived to support the simulation of USAF aircraft delivery of unguided weapons and to assess the hazards to the delivery aircraft from its own weapons effects.

Program Element: #62602F Title: Conventional Munitions
DOD Mission Area: #523, Engineering Technology (ED) Budget Activity: #2, Technology Base

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: (Continued.)

C. (U) Project: 2543, Weapon Evaluation/Effects Methodology. (Continued.)

The program will continue developing target models for advanced Soviet fighting vehicles and advanced SAM carriers and continue to improve upon the evaluation of shaped charge jets and self-forging fragments. Threat descriptions and damage models of advanced Soviet aircraft and helicopters, such as the Ground Support Fighter and the Hind helicopter, will be developed. Several advanced warhead concepts will be tested against hardened military structures. Methods for analysis of building structural integrity given various damage levels to load bearing walls and columns will be developed.

D. (U) Project 2560, Direct Fire Weapons Technology. This project establishes the technology base for aircraft guns, ammunition, fire control, propellants, and explosives, leading to improved lethality, reduced cost, and improved safety and handling characteristics. In FY 1982, the Gun Technology Definition Study was completed, showing that an advanced gun will complement other aircraft armament. Initial work on electronic fuzes, telescoped ammunition guns, and electromagnetic and light gas guns was accomplished. Excellent progress continued in high yield and insensitive explosives. In FY 1983, design and testing will be completed on a sabot diverter which will be needed for safe firing of advanced 30 millimeter armor piercing ammunition. Work will begin on advanced ammunition ballistic analysis, proximity and void-sensing fuzes, and electromagnetic gun weaponization. Castable high energy explosives will be tested in Viper warheads. Explosives based on the insensitive ethylene diamine dinitrate/ammonium nitrate (EA) system developed at the Armament Laboratory will undergo interim qualification for use in bombs. Work will continue on improved ammunition propellants. The projectile design analysis system will be expanded. In FY 1984, the program will demonstrate advanced ammunition interior/exterior ballistic performance and complete assessment of high performance barrels for advanced aerial gun systems. Design studies of critical components and advanced ammunition concepts to increase lethality of future gun systems will begin. High velocity light gas gun weaponization tasks will begin. The program will initiate studies of the airblast characteristics of insensitive explosives based on aluminum and lead nitrate and of high performance explosives and extrusion systems with energetic binders of prepolymer/plasticizers. Composite metal hydrides mixed with nitramines for controlled detonation properties will be studied. EA explosives will be interim qualified for use in warheads and submunitions. Aging and compatibility studies will be completed. Development of future gun system propellants with high energy oxidizers and high energy binders will continue.

E. (U) Project 2567, Weapons Carriage and Release Technology. This project addresses the crucial interface between munitions and the carrying aircraft without which reliable, accurate delivery and multimission flexibility will be severely compromised. In FY 1982, joint Air Force-Navy requirements for stores management were established, based on Military Standard 1760, "Aircraft Stores Interface." Wind tunnel and flight tests were conducted to refine analytical methods for aerodynamic heating, and improved test methods were started for aircraft/stores compatibility. In FY 1983, the program will complete fabrication of the Low Level Delivery System and conduct store separation tests of the concept on the sled track at Holloman AFB. An airbag ejector concept for semi-submerged carriage and release of stores will be studied. Work will continue on carriage and release concepts and computer models that enhance aircraft performance and survivability. Development of techniques for applying fiber optics as a high speed communications medium between aircraft and stores and studies of very high speed data transfer methods and advanced store control

Program Element: #62602F | Title: Conventional Munitions
DOD Mission Area: #523, Engineering Technology (ED) | Budget Activity: #2, Technology Base

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: (Continued.)

E. (U) Project 2567, Weapons Carriage and Release Technology. (Continued.)

algorithms will continue. The analytical data base for weapon airframe technologies for shapes, materials, and structure and the initial design for representative weapon airframes will be completed. Development in the shaping technology for supersonic submunition dispersal will continue. In FY 1984, the project will complete development of a computer program to predict required ejector performance and initiate a study to determine the impact of advanced aircraft technologies (direct sideforce control, mission adaptive wing, forward swept wing, etc.) on carriage and release requirements. A contract will be let to develop very high speed data transfer protocols for use with fiber optics. Support for the Armament System Integration Laboratory for test, validation and demonstration of advanced integration technologies and for MIL-STD-1760 will continue. Distributed airloads evaluation will be studied as a cost effective way to determine airload in various aircrft flowfields. The analytical data base for submunition technology for supersonic dispersal and initial designs for representative submunitions will be completed.

F. Project 2946, Chemical Warfare. This effort begins in FY 1983 with preliminary planning and evaluation work as described in the FY 1983 Descriptive Summary. Project 2946 has been established to carry the funding for this crucial activity. United States policy is to deter enemy first use of chemical and biological weapons by modernizing chemical systems to provide a credible and effective retaliatory capability. This project responds to HQ United States Air Force and Air Force Systems Command tasking and will establish the technology base for superior chemical weapons to meet Air Force and national objectives. [

] The effort will feed into an advanced development program to define, build, and test competing weapon system configurations.

8. (U) Project 06AL, Air Force Armament Laboratory Operations (PROJECT OVER $10 MILLION IN FY 1984):

A. (U) Project Description: This project provides for the support activities required to operate the Air Force Armament Laboratory, Eglin Air Force Base, FL. The Air Force Armament Laboratory is responsible for the exploratory and advanced development of non-nuclear conventional munitions. This project provides funds for the pay of civilian scientists, engineers, and support personnel, travel, transportation, rents, communication and utilities costs, procurement of supplies and equipment, contractor support services, and, environmental impact studies of munition testing at the Armament Division.

B. (U) Program Accomplishments and Future Efforts: Not applicable.

C. (U) Major Milestones: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #62702F
DOD Mission Area: #521, Electronics and Physical Sciences, (ED)

Title: Command, Control & Communications
Budget Activity: #1, Technology Base

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	67,323	69,812	69,254	75,124	Continuing	N/A
06RA	Laboratory Operations	31,350	32,022*	33,982	34,394		
2338	Assurance Techniques for Electronics	5,370	5,500	5,132	5,880		
4506	Surveillance Technology	6,665	7,000	6,540	7,650		
4519	Communications & Control Technology	4,421	4,440	4,140	4,780		
4594	Intelligence Technology	6,443	6,300	5,880	6,850		
4600	Electromagnetic Radiation, Devices & Components	5,674	7,150	6,670	7,660		
5581	Information Sciences Technology	7,400	7,400	6,910	7,910		

*Excludes 1 Oct 1982 Civilian Pay Raise

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides a broad technology base for advancing Air Force mission capabilities in Command, Control and Communications (C^3), a mission requirement which is rapidly increasing in significance. Operational problems addressed include improving the effectiveness and survivability of C^3 systems, obtaining ultra reliable, secure global communications, improving range and detection capability against new threats in ground, airborne, and space based radars, improving the timeliness and quality of intelligence warning data and decision making, and increasing the availability of operational systems. Six basic technology areas are applied to these problems: Surveillance; Intelligence; Communications and Control; Information Sciences; Electronic Reliability and Electromagnetic Compatibility; and Electromagnetic Radiation, Devices and Components. The program element also provides for the operation of the Rome Air Development Center (RADC), Griffiss AFB, Rome NY, and the RADC Deputy for Electronic Technology, Hanscom AFB, Bedford, MA.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	65,887	69,840	75,363

Changes reflect the addition of the 1 Oct 1981, Civilian Pay Raise, for FY 1982, and a permanent administrative shift, beginning in FY 1982, for funding of the Research and Development Computer Facility from Project 5581 into Project 06RA. Also, funding for laboratory-wide office automation support, previously funded in each technical project, was consoli-

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dated into Project 06RA beginning in FY 1982. In FY 1983, Project 4600 has increased for special emphasis in fiber optic components and conformal antennas. For FY 1984, a 6,109K reduction, equally distributed in the six technical projects, will reduce funding for new start contracts by forty percent.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Estimated Cost
Military Construction, Funds		900	2,250	603		

5. (U) RELATED ACTIVITIES: This program is actively coordinated at tri-service and interagency levels to preclude duplication and to meet overall Department of Defense (DOD) needs. Examples of this coordination are the DOD Advisory Group on Electronic Devices, the Interservice Antenna Group, the Technology Coordinating Paper on Electronics, and the DOD Embedded Computer Research and Development Technology Panel. DOD has fostered close coordination between the Services in several technology areas affecting this program, particularly in surveillance and communications areas. Space based radar surveillance programs are closely planned with the Navy and a joint agreement in technology efforts is in effect. A tri-service fiber optics working group has been revitalized and has established a coordinated program. Participation in various North Atlantic Treaty Organization (NATO) panels and working groups and liaison with the European Office of Advanced Research and Development further coordinates program efforts. Work performed is related to electronics efforts at the Air Force Avionics Laboratory, Air Force Weapons Laboratory, Lincoln Laboratory, the Army Electronics Command, Office of Naval Research, National Aeronautics and Space Administration, the Defense Advanced Research Projects Agency and other government agencies. Image exploitation programs are coordinated through a national committee while the Defense Mapping Agency (DMA) coordinates all service programs in mapping and charting. The National Security Agency coordinates all service programs in signals intelligence and the Defense Intelligence Agency coordinates all work in intelligence data handling. Basic research in Program Element 61101F, Defense Research Science, directly feeds into this program. Major advanced development programs assigned to RADC which receive direct transfers are: PE 63728F, Advanced Computer Technology; PE 63750F, Counter-Countermeasures Advanced Development; PE 63789F, Command, Control and Communications Advanced Development; PE 63747F, PAVE MOVER; PE 63726F, Fiber Optics for C^3I; PE 63259F, Cartographic Applications. Efforts in this program are also transitioned into other program elements such as PE 63208F, Reconnaissance Sensors/Processing Techniques; PE 63431F, Advanced Space Communications; PE 31011G(F), Cryptological Activities; PE 32022F, Scientific and Technical Intelligence; PE 31025F, Intelligence Data Handling Systems; and PE 64750F, Intelligence Equipment. Related non-Air Force programs are: PE 63701B, Mapping and Charting; PE 62725A, Computer and Information Sciences; PE 62705A, Electronics and Electronic Devices; PE 62712N, Surface/Aerospace Target Surveillance; PE 62721N, Command and Control Technology; and PE 62762N, Electronics Device Technology. Technical support is provided to the Electronics System Division, Space Division, the Defense Mapping Agency (DMA), Defense Intelligenc Agency (DIA), Defense Communications Agency (DCA), Defense Nuclear Agency (DNA), the Army and Navy.

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6. (U) WORK PERFORMED BY: The top five contractors are: PAR Technology Corporation, Hartford NY. (Project 4594); General Electric Company, Sunnyvale CA. (Project 2338); Honeywell Inc., McLean VA. (Project 5581); Harris Corporation, Rochester NY. (Project 4519); Raytheon Company, Wayland MA. (Project 4506). There are a total of 90 contractors doing 38 million dollars of contract work. The inhouse work is performed by the Rome Air Development Center (RADC), Griffiss AFB NY, and the RADC Deputy for Electronics Technology, Hanscom AFB MA.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: #2338, Assurance Techniques for Electronics. This project provides the Air Force with basic technology in reliability and maintainability (R&M) techniques and in electromagnetic compatibility (EMC). The technologies are essential to Air Force systems dependent on electronics and have assumed paramount importance with the advent of new electronic components such as large scale integrated circuits (LSI). Although one of the chief payoffs is low systems life cycle costs, the critical factor is systems availability. The lessons learned in these technologies are transitioned directly to users by the preparation of various military specifications and standards. In FY 1982, the solid state device reliability task yielded the development of a new laser photoscanning technique for the analysis of the electrical operation of complex microcircuits. An electrical analysis capability was established for the evaluation of analog microprocessors and coder/decoder circuits used in adaptive processing applications. Reliability assessments were completed on new device technologies ranging from high speed switching transistors to 16 bit microcomputers and 64K dynamic random access memories. The Equipment/System R&M tasks produced the RADC Testability Notebook, Parts Derating Guidelines, Thermal Guide for Reliability Engineers and other products aimed at improving the availability of electronic systems. The EMC program resulted in models for predicting the performance of microelectronic based systems in complex electromagnetic environments. EMC circuit design techniques were developed to reduce transmitter broadband noise and spurious outputs of solid state receivers. The FY 1983 Solid State Device reliability programs will focus on evolving a new approach to the electrical testing and reliability verification of complex microcircuit performance via the use of computer aided test techniques derived from the computer aided design and manufacturing areas of device production. Programs will also begin in the examination of reliability techniques necessitated by the application of highly customized devices manufactured in "silicon foundries." The commercial "foundries" will have the capability of yielding large numbers of custom circuits and reliability aspects of the manufacturing method must be determined. The Equipment System R&M program will concentrate on determining the impact of combined hardware/software malfunctions on system operational availability. Artificial Intelligence techniques will be examined for improving the fault detection/isolation functions at the equipment/system level. The EMC program, in FY 1983, will acclerate the development of EMC analysis, prediction and measurement technology for solid sate electronic systems. The EMC control program will define the design capabilities needed to improve collocation of wideband electronic systems and to incorporate new modulator and antenna coupler technology. The FY 1984 program will address investigations of failure mechanisms and design for reliability of submicron scale microelectronic devices such as very high speed integrated circuits (VHSIC). System testability and hardware/software technology studies will be continued to demonstrate the prediction methodology for total system reliability. Improved transmitter/receiver technology will be developed to reduce EM interference in electronic systems and antenna model updates will be included in the EMC prediction programs used by system developers.

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DOD Mission Area: #521, Electronics and Physical Sciences, (ED)

Title: Command, Control & Communications
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7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

B. (U) Project: #4506, Surveillance Technology. The objective of this project is to develop advanced ground, airborne, and space based system and sensor concepts and the associated technology base for application to future Air Force surveillance needs. The major thrusts include development of new surveillance radar, Electronic Counter-Countermeasures, identification, and survivability technologies for both Tactical and Strategic surveillance. New technology is also addressing the problem of detecting and tracking low observable threats, such as cruise missiles. Space systems and mobile tactical systems require extremely high power tubes and that technology is also developed in this project. In FY 1982, supporting technologies for the Advanced Tactical Radar (ATR), which has started advanced development, successfully defined integrated radar/communications requirements and decoy techniques to improve the survivability of that radar. A section of a new membrane antenna for the space based radar was successfully tested for radio frequency characteristics. Transmit/receive modules needed for the space based radar were demonstrated as integrated elements and several are being produced. A design for augmenting gap filler radars to see cruise missile size targets was completed and transitioned to the North Warning Dew Line program. Design of a high altitude conformal radar for the next generation E-3A Airborne Warning and Control System (AWACS) was completed. A new type Traveling Wave Tube (TWT) for aircraft was produced which will bypass present manufacturing limitations, greatly speeding up the production of these tubes at one fifth the present cost. In FY 1983, a distributed processor for the space based radar will be demonstrated using eight computing sections tied together to verify the architecture and software operating system. An analysis of requirements to adapt this processor for use on the next generation E-3A will be completed. Validation will be done for a new method of detecting low radar cross-section targets which will increase probability of detecting cruise missiles. In FY 1984, developments for the Advanced Airborne Surveillance Radar (next generation E-3A) will continue transition to advanced development, begun in FY 1983, and small arrays of antennas using the space radar transmit/receive modules will be fabricated for dual use on this airborne radar. The integrated communications/radar effort and the radar decoy efforts will transition into advance development. Space based radar modules will be further developed with the membrane lens technology leading to a late 1980's ground demonstration. The distributed signal processor for such a radar (the radar is roughly the size of a football field) will be assembled on a larger scale using very large scale integrated circuits for test purposes. Traveling wave tube improvements, including new test techniques and a new tube design for greater reliability will transition to support the Defense Satellite Communications System (DSCS) program. Initial demonstration of improved detection of cruise missiles will be ready for transition to advanced development.

C. (U) Project: #4519, Communications and Control Technology. This project addresses communications needs ranging from very low frequencies to optical frequencies. It develops technology for increasing communications data rates, survivability and flexibility. An example of important technology is in the area of adaptive high frequency (HF) communications technology to provide secure voice and data over adaptive high frequency paths. Another example of high payoff technology in this project especially for tactical users is in fiber optics technology, because it provides increased

Program Element: #62702F   Title: Command, Control & Communications
DOD Mission Area: #521, Electronics and Physical Sciences, (ED)   Budget Activity: #1, Technology Base

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: (continued)

C. (U) Project: #4519, Communications and Control Technology. (continued)

bandwidth, 10-to-one savings in deployment weight and 20-to-one increase in transmission distance. This project also develops improved satellite communications and tropospheric (tropo) communications technologies. In FY 1982, a fiber optic 26-pair tactical cable replacement was transitioned to advanced development. Efforts on fiber optics standardized "family" of components - transceivers, optic bus interconnects and wavelength division multiplexers continued. Tactical tropo efforts focused on completion of a rapidly deployable tropo design to increase mobility and tactical communications response times as tropo is one of the backbone elements in the tactical theater scenario. A phased array, jam resistant tropo antenna, adaptive to increased survivability was completed. High frequency, narrowband voice components began transition to advanced development. In FY 1983 and FY 1984, fiber optics standard components and tactical replacement components will continue transitions to a new start advanced development program and to feed a common bus development to connect tactical shelters. Tactical tropo efforts will support the Tri-Tac program for enhanced jam resistance. A flexible digital satellite terminal, operating at extremely high frequency for improved aircraft to satellite performance will be developed; High Frequency (HF) Communications efforts will deliver narrowband voice encoders for near term improvements in secure modes for advanced development and wideband technologies for high data rate users will be pursued for far term HF needs.

D. (U) Project: #4594, Intelligence Technology. This project provides the technological advances to improve and/or automate techniques to extract maximum useful and timely information in four areas of intelligence exploitation - signal processing, nonnumeric (words, message text, etc.) data processing, imagery exploitation and advanced cartographic and photogrammetric techniques. In signal processing, specific objectives are: The development of necessary recording and data handling techniques for the timely processing, storage and dissemination of extremely high data rate, high capacity digital information; the application of automatic speech processing and pattern recognition to specific problems; and the development techniques to counter the denial of conventional sources of scientific and technical information on foreign weapons systems. In nonnumerical data processing, the purpose is to develop and apply automated techniques for the timely processing and dissemination of large amounts of dissimilar intelligence required for decision making. Techniques being investigated include active information concepts, automatic data base generation, survivable data bases, distributed data base access and the application of mathematical, logical, and statistical techniques to the intelligence analysis process. In imagery exploitation, hardware and techniques are developed which improve the quality and timeliness of military target intelligence derived from strategic and tactical reconnaissance sensor systems. The cartographic and photogrammetric area devises new and improved methods and equipments for exploiting mapping imagery in the timely generation of digital and analog chart products and target materials of Air Force use and also to support the Defense Mapping Agency's production of worldwide digital data bases. In FY 1982, accomplishments in signal processing included demonstration of the capability to record/reproduce digital data at up to 400 megabits/second on an exploratory development model computer compatible tape drive and demonstration of an isolated word speaker dependent recognition system which has a 100 word vocabulary, a 98 percent recognition accuracy and operates in real time. In nonnumeric data processing, mathematical, logical, and statistical aids for intelligence analysis were developed. These analytical aids are designed to advance the analyst from merely reporting events to describing what the event may mean and to extrapolate future events. In image processing,

Program Element: #62702F
DOD Mission Area: #521, Electronics and Physical Sciences, (ED)

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Budget Activity: #1, Technology Base

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: (continued)

D. (U) Project: #4594, Intelligence Technology. (continued)

several capabilities which provide an environment for developing and testing near real time digital exploitation methodologies and algorithms were completed. One permits the incorporation of artificial intelligence (AI) techniques for target detection and identification. A second provides automated scenario generation to incorporate known information about movement and related activities of enemy ground forces into the testing process. In cartography and photogrammetry a completely digital target location technique that includes a monoscopic geopositioning technique has been developed and demonstrated. In FY 1983 and FY 1984, the following goals will be accomplished. Under the signal processing task, the On Line Digital Disk (Juke Box) will be delivered. This will provide storage a 10^{13} bit storage capability with access to any bit in five (5) seconds. This equivalent of 100 long playing phonograph records will replace present libraries of hundreds of thousands of magnetic tapes requiring days to access. Speech recognition development will continue with emphasis on connected speech recognition independent of speaker. A programmable voice synthesizer will be designed with a capability to operate in noisy environments, handle different dialects and function independent of language. The usefulness of analytical methodologies in attempting to anticipate adversary behavior will be determined against an airfield activity monitoring function. In image processing, the integration of artificial intelligence techniques into the exploitation process to provide automated target detection and identification will continue. Cartography/photogrammetry will continue tactical target location developments to provide the Air Force field elements with a capability to obtain, in near real time, very precise geopositional information to support all weather precision weapon delivery. A study to define the overall Air Force needs for digital cartographic data for future systems will be completed and will transition to advanced development.

E. (U) Project: #4600, Electromagnetic Radiation, Devices and Components. This project provides the Air Force with a strong technology base and the devices and techniques for exploitation of electromagnetic radiation in command, control and communications (C^3), surveillance and other related systems. Principal areas of activity are: Antennas and radio frequency components, electromagnetic techniques, propagation, electromagnetic materials for C^3 applications, advanced solid state devices and circuits, optical and electro-optical devices, and technology for radiation hardening. It provides methods of increasing antijam capabilities and survivability aspects of strategic and tactical C^3 systems. This project produces optical device and cable technologies used in Project 4519, Communications and Control Technology, and produces faster, cheaper, much smaller components for such critical functions as tactical radar signal processing and time and frequency subsystems. Radiation hardening ensures C^3 mission availabilities in spite of nuclear and space environments. In FY 1982, antenna nulling technology and low power feed techniques were completed which will allow design of a highly jam resistant space based radar antenna being developed in Project 4506, Surveillance Technology. Frequency variations which limit accuracy of frequency standards needed for precise timing were reduced drastically by development of a new digital/analog device. A receiver for a high frequency ducted mode experiment was completed. A new method of producing high quality quartz needed for resistance to radiation was produced and transitioned to industry. In FY 1983, antenna design techniques for space radar will continue and phased array conformal antennas for use with satellite communications terminals on high performance aircraft will begin development. A ruggedized fiber optic connector will

Program Element: #62702F
DOD Mission Area: #521, Electronics and Physical Sciences, (ED)

Title: Command, Control & Communications
Budget Activity: #1, Technology Base

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: (continued)

E. (U) Project: #4600, Electromagnetic Radiation, Devices and Components. (continued)

be developed to allow transmission over longer distances in tactical environments. A commercially available microcomputer on a chip will begin redesign into a radiation hardened version for general military use and will be demonstrated in late FY 1984. The experiment to map the high frequency ducts for possible communication use is scheduled for FY 1984. New lasers on a chip and light diodes which will allow transmitting longer distances over fiber optic cables will be developed and transitioned for military use via advanced development.

F. (U) Project: #5581, Information Sciences Technology. This project was formerly all computer technology oriented but beginning in FY 1982, that portion of Project 4519, Communications and Control Technology, dealing with command and control technologies was moved to this project. Specific items which transitioned into Project 5581 are emitter location work for Command, Control and Communications Countermeasures (C^3CM), information processing and display technique for modular control facilities, command and control experimentation technologies for simulating real world crisis management environments. The remainder of Project 4519 efforts are communications oriented. Project 5581 also retains its computer hardware/software emphasis. It is the Air Force exploratory development effort which provides technologies to solve generic problems experienced in the acquisition and maintenance of computers and associated software which are embedded in Air Force weapon systems. The primary objective is to reduce the costs associated with all phases of computer resource acquisition and support. In FY 1982, detailed descriptions of Command, Control and Communications (C^3) nodes and emitter location technology needed for enemy target recognition were completed. Improved methods to more accurately locate emitters from single aircraft were developed. The exploratory development of the first decision aid for tactical commanders, a knowledge based mission planner, was completed. Software requirements engineering methodology work began and Ada Integrated Environment (AIE) tools, being developed for use when that higher order computer language is introduced, continued with completion of the preliminary design. A definition of a proof of principle demonstration of an extremely high throughput, Josephson Junction technology computer (JJT), was completed. The establishment of a laboratory capability to exploit artificial intelligence (AI) techniques for Air Force use was begun. In FY 1983, efforts in C^3 node location will transition to advanced development and emphasis will be placed on control and execution aids for C^3CM. A design for a control center for use with systems such as PAVE MOVER will be ready for advanced development. Three major decision aids will continue development and the mission planning aid will be modified for real time replanning. The software requirements methodology evaluation will be completed and a rapid software design capability with the user in the loop will be initiated. Exploratory development of the AIE will be completed and will transition to advanced development. Artificial intelligence will be applied to the automated programming and decision aids developments as a technical center of excellence is developed. A Command and Control simulation facility, to be completed in FY 1983, will be used in FY 1984 to evaluate the developed decision aids with real tactical commanders used in the tests. Also in FY 1984, efforts for local area networking of computers and for distributed, survivable systems will continue. Decision aids will begin to address strategic applications and artificial intelligence will continue to be adapted for military exploitation.

Program Element: #62702F
DOD Mission Area: #521, Electronics and Physical Sciences, (ED)

Title: Command, Control & Communications
Budget Activity: #1, Technology Base

8. (U) Project: #06RA, Laboratory Operations. PROJECTS OVER $10 MILLION IN FY 1984:

A. (U) Project Description: This project provides the support activities required to operate the Rome Air Development Center (RADC), Griffiss AFB, NY, and the RADC Deputy for Electronic Technology, Hanscom AFB, MA. Support provided includes the pay and related costs of civilian scientists, engineers and supporting personnel, travel, transportation, rents, communications, utility costs, procurement of supplies and equipment, and contractor support services. RADC is responsible for exploratory development and advanced development programs in surveillance, communications and control, intelligence, information sciences, electronic reliability, electromagnetic compatibility, electromagnetic radiation, devices, and components. It is also responsible for technology intensive engineering development programs, primarily in the intelligence area. RADC also provides technical support to current and future systems programs. This project supports and complements all the technical projects under this program element and numerous other programs being performed at the Rome Air Development Center. This project also funds upgrade of the administrative processing systems needed to support and reduce the workload of the laboratory contract managers by utilizing office automation and management information systems technology developed in this project.

B. (U) Program Accomplishments and Future Efforts: Not Applicable.

C. (U) Major Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #62703F
DOD Mission Area: #522 - Environmental and Life Sciences (ED)

Title: Personnel Utilization Technology
Budget Activity: #1 - Technology Base

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	5,537	6,500	8,157	8,770	Continuing	N/A
06HP	Laboratory Support	4,319	3,696*	3,899	4,042		
7719	Force Acquisition and Distribution System	959	1,822	3,143	3,578		
7734	Force Management System	259	982	1,015	1,150		

* Excludes 1 Oct 82 civilian pay raise

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Air Force requires a continuing supply of quality personnel who can operate and maintain sophisticated weapon and support systems. The identification, acquisition, classification, training, and retention of a quality enlisted force is difficult. The proportion of quality men and women who are adaptable to military life is limited and their recruitment and retention subject to fierce competition from the civilian sector. The Air Force must ensure that every effort is made to identify individuals who might contribute to the Air Force mission, that they are assigned to jobs which match as nearly as possible their talents and aspirations, and that efforts be made to retain these individuals. This manpower and personnel research program incorporates two interrelated streams of research designed to address the problems involved in acquiring and maintaining a quality force. Included in the Force Acquisition and Distribution System are efforts to develop and validate testing procedures to identify those individuals capable of being trained for Air Force jobs. Improvements in tests will result in fewer individuals being rejected for military service who could have succeeded, as well as fewer individuals being accepted and ultimately failing training which was too difficult for them. Additional efforts will determine specific aptitude requirements for Air Force jobs and improve the process for matching individuals to jobs. The Force Management System will provide Air Force managers with devices, models, and strategies to improve retention, individual/unit productivity, and the evaluation of job performance and establish comprehensive skills management and reenlistment/career assignment programs. Operation and maintenance of the Air Force Human Resources Laboratory (AFHRL), Brooks AFB TX, is partially funded in this program including civilian salaries, administrative support, etc.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

RDT&E	5,391	7,194	7,921	Continuing	N/A

4. (U) OTHER APPROPRIATION FUNDS: Not applicable.

Program Element: #62703F Title: Personnel Utilization Technology
DOD Mission Area: #522 - Environmental and Life Sciences (ED) Budget Activity: #1 - Technology Base

5. (U) RELATED ACTIVITIES: Related PEs are 61102F, Defense Research Sciences; 62763N, Personnel and Training Technology; 63707N, Manpower Control System Development; 62717A, Human Performance Effectiveness and Simulation, 63731A Manpower & Personnel; 62205F, Training and Simulation Technology; and 63704F, Manpower and Personnel Systems Technology. Efforts by the Air Force directed toward the improvement of the Armed Services Vocational Aptitude Battery and the production of new forms of that test are directed, in part, by a triservice steering committee of General Officers. Similarly, efforts concerned with the development of computer-based testing techniques, for eventual implementation at Military Enlistment Processing Stations, are coordinated with the other services through a triservice steering committee. Air Force responsibilities lie principally in the development of test items suitable for computer implementation. Efforts across all services on performance criteria development are coordinated by a newly developed working group whose activities are monitored by OASD (MRA&L). Close coordination is maintained both at the working level and by laboratory management with other services. Exchange of proposed statements of work for contractual efforts, wide dissemination of technical reports, and symposia and meetings attempt to ensure that work conducted within this program element does not duplicate work conducted by the other service laboratories.

6. (U) WORK PERFORMED BY: OAO, Inc., Ft Worth TX (7719 and 7734); McFann Gray & Associates, Monterrey CA (7719); Resource Research Corp., Washington DC (7719); University of Dayton Research Institute, Dayton OH (7719); Kinton Corp., Alexandria VA (7719). Twelve additional contractors ($269K). This program is managed by the Manpower and Personnel Division of the Air Force Human Resources Laboratory, Brooks AFB TX.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: 7719 - Force Acquisition and Distribution System. Research in this project, which is classified in the manpower and personnel Congressional category, involves topics dealing with Air Force selection, classification, and assignment technologies. Since the quality and quantity of service-eligible young people is anticipated to decline significantly over the next decade, research needs to be conducted to improve Air Force selection and assignment systems. An experimental battery, containing measures of perceptual motor and information processing abilities, was developed and was administered to pilot selectees in FY 1982. This battery included such tests as attention sharing, task saturation, self-confidence and others thought to be related to pilot performance. The Air Force Reading Ability test was developed in FY 1982 and operationally implemented at basic training to identify individuals who require remedial training. Cost avoidance of approximately $1.4M yearly in training is realized as this test results in identification and remedial training of airmen who would otherwise be separated because of an inability to read job-related material. During FY 1983 criteria data will become available which will be used to validate the experimental battery of tests for pilot selection. These tests include examination of perceptual, psychomotor, and other specific abilities. Measures of these abilities, which are not typically assessed through conventional paper-and-pencil tests, may be applied to the improved selection of pilot trainees and their subsequent assignment to specialized training tracks. This research will lead to a reduction in pilot training attrition resulting in significant cost and resource savings. Additionally, Air Force pilot selection testing innovations have been quickly adopted by the other services. The effort to develop a Training Decisions System to assist in identifying the type of training required for certain jobs or parts of jobs will also be initiated during FY 1983. This research will provide general approaches which can be transitioned to advanced development projects. Comprehensive efforts on occupational specialty standards will provide results in FY 1983.

Program Element: #62703F   Title: Personnel Utilization Technology
DOD Mission Area: #522 - Environmental and Life Sciences (ED)   Budget Activity: #1 - Technology Base

The specification and evaluation of the impact of aptitude requirements, and the specification of strength and stamina requirements will be accomplished. To properly place individuals in jobs that suit their abilities, it is necessary to have a complete description of the tasks performed in each job and their relative difficulties. These job/task analyses may then be related to the abilities of incoming personnel. Research in this area will continue with the expectation that the aptitude, education, experience, and physical factors necessary to perform the jobs in the Air Force will be identified and related to ability and demographic characteristics of recruits. This research will lead to an improved Person-Job-Match model with eventual benefits for both the Air Force and its personnel. Comparable versions of the Armed Services Vocational Aptitude Battery (ASVAB) and a new version of the Air Force Officer Qualifying Test (AFOQT) will be completed and implemented in FY 1984. A selection test for air traffic controllers will be developed and validation studies for all of these instruments will be started. The research to develop improved selection tests to identify the skills and abilities which determine combat effectiveness in different aircraft types will continue. During FY 1984 additional criteria data will become available, particularly performance data from operational units, upon which the tests administered in FY 1982 will be validated. The large increase in funding is in response to a significant increase in research needs from the using commands.

B. (U) Project: 7734 - Force Management System. This project is classified in the manpower and personnel Congressional category. The Air Force needs to develop strategies and techniques which will achieve better force utilization and higher retention of qualified personnel. The current recruiting environment will become much harsher as the economy improves, requiring more sophisticated management tools to increase retention and optimally man the force. An experimental performance criterion development model was developed in FY 1982 and will be used to guide future research in on-the-job performance measurement. This area of research deals with the development of exploratory techniques for the optimal utilization of the Air Force personnel resources and the development of models to allow Air Force management to explore the possible effects of various forces and events occurring both within the Air Force and from the outside upon the structure and effectiveness of the force. In addition, a large effort initiating research on basic skills will begin. This research will provide much needed information on the functional literacy requirements of Air Force jobs. Efforts to identify measures of productivity will continue and focus on the identification of those factors, especially those under management control, that act to limit productivity. The development of task-level job performance measurement techniques based on the job performance measurement model developed in FY 1982 will continue with an expected transition to an advanced development program in FY 1984. The development of on-the-job performance criteria against which selection devices will be validated will continue in FY 1984. The identification of both individual and organizational constraints to productivity should be completed in FY 1984. Limited field tests and validation of improved management techniques based on those constraints will continue. Examinations of job characteristics and requirements and the relation of those parameters to the characteristics and abilities of successful and unsuccessful job incumbents will continue to be assessed in manpower management and policy models to build toward the accumulation of a complete description of all Air Force specialties.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63103F Title: Advanced Airborne Radar
DOD Mission Area: #551, Electronic and Physical Sciences (ATD) Budget Activity: #2, Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING)($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT			4,174	9,423	Continuing	N/A
2831	Covert Strike			4,174	9,423	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Surface-to-air defenses in the 1990s will be extensive, requiring covert ingress and egress if the aircraft and crew are to survive. This program element funds advanced development of a radar concept which will lower the enemy's ability to detect attacking aircraft. Develops a bistatic radar system providing a covert/survivable in-weather strike/reconnaissance capability which satisfies both Air Force validated mission requirements for advanced tactical fighter/bomber and penetrating recce aircraft.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: This program was originally planned as an FY 1983 new start, but was delayed to FY 1984.

4. (U) OTHER APPROPRIATION FUNDS: NONE.

5. (U) RELATED ACTIVITIES: The Covert Strike program builds upon the joint Defense Advanced Research Projects Agency/Air Force Avionics Laboratory Tactical Bistatic Radar Demonstrations and Bistatic Technology Transition, and the Covert Strike System Study effort funded in PE 62204F (Aerospace Avionics). It also draws upon low probability of intercept, automatic target classification and monostatic ultra-high resolution synthetic aperture radar technologies being pursued in PE 63203F (Advanced Aircraft Avionics). The Very High Speed Integrated Circuits technology being pursued under PE 63425F (Very High Speed Integrated Circuits) will be used in the radar signal processor in the final Consolidated Demonstration. Covert Strike will also make use of the blended aerodynamic shape technology (weapon airframe technology) from PE 62601F (Conventional Munition Technology). Inter-Service coordination takes place in the Joint Air Force/Navy Radar Working Group, the TriService Airborne Displays Working Group, and a Tri-Service Background and Targeting Agreement originated by the Air Force Armament Laboratory.

6. (U) WORK PERFORMED BY: The Air Force Wright Aeronautical Laboratories/Avionics Laboratory, Wright-Patterson AFB, OH, and the Air Force Armament Laboratory, Eglin AFB, FL, will manage work performed under this program.

Program Element: #63103F Title: Advanced Airborne Radar
DOD Mission Area: #551, Electronic and Physical Sciences (ATD) Budget Activity: #2, Advanced Technology Development

7. (U) ADVANCED AIRBORNE RADAR (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984)

A. (U) Project Description: Conducts investigations of bistatic radar concepts including operational requirements analysis, receiver/processor design, waveform selection, timing system accuracy requirements, navigation/reference system performance requirements, processing algorithm development, signal processor performance and software design, system fabrication and flight test (including flight test).

B. (U) Program Accomplishments and Future Efforts:

1. (U) FY 1982 Accomplishments: Not Applicable.

2. (U) FY 1983 Program: Not Applicable.

3. (U) FY 1984 Planned Program: Initiate the Bistatic Synthetic Aperture Radar efforts to demonstrate feasibility of bistatic covert acquisition and accurate tracking of fixed and mobile surface targets. This test system will demonstrate, under limited maneuvering (3 g's or less), an on-board, real-time bistatic capability with high resolution synthetic aperture radar at near operational ranges. Initiate the Advanced Integrated Reference System effort to demonstrate precision reference system (position, velocity and time) sensors to provide the accurate reference frame required for ultra-high resolution synthetic aperture radar imagery. Emphasizes development of precision time standards and a feasible approach for maintaining coherent radar operation between the separately located illuminator (transmitter) and aggressor (receiver) aircraft.

(U) The major program objective is to develop a covert/survivable in-weather strike/ recce capability for the 1990s. The principal technology used is bistatic radar, where the target is illuminated by a radar operating in a sanctuary while the strike/recce aircraft penetrates and acquires the target in a "listen only" mode. This technique allows effective use of stealth technologies, enhances surprise attack, and denies the enemy effective use of high gain jamming. The FY 1984 funding begins initial work to demonstrate bistatic target acquisition and reference system technologies to show concept feasibility. Cost is based on engineering estimates derived from experience on similar advanced development programs.

(U) The program consists of four major efforts pursuing key technical areas. Together they will demonstrate feasibility and provide all necessary information for Full Scale Development of a Covert Strike, bistatic radar. Bistatic radar technology feasibility will be demonstrated by FY 1988 with near term application to strategic and tactical missions through the addition of a passive mode to inventory and/or advanced systems.

(U) The Bistatic Synthetic Aperture Radar effort will demonstrate the feasibility of bistatic, covert acquisition and accurate tracking of fixed and mobile surface targets. The Advanced Integrated Reference System effort will develop and demonstrate precision reference (position, velocity, time) sensors to provide the accurate reference frame required for ultra-high resolution synthetic aperture radar imagery. Full use of the Covert Strike bistatic radar system necessitates early investigation of weapons which will exploit this capability. The Weapon Development Demonstration effort will investigate how advanced weapon concepts such as tactical munitions dispensers with very low radar cross sections can be integrated with the Covert Strike system. The final phase of the program is the Covert Strike Consolidated Demonstration which provides a flight test of the "full-up" Covert Strike system.

5. (U) Program to Completion: Complete design and begin hardware fabrication on the Bistatic Synthetic Aperture Radar and Advanced Integrated Reference System efforts. Initiate Weapon Development Demonstration to investigate how advanced weapon concepts can be integrated with Covert Strike to fully exploit its covert capabilities. This project will examine tactical munitions dispensers with very low radar cross sections as well as alternative launch and forget missiles. Feasibility of the Covert Strike concept is to be proved by FY 1988. At this time, sufficient technology will have been demonstrated to permit application to strategic and tactical missions through the addition of a passive mode to inventory (F-15, F-16, and B-1B) and/or advanced systems. If the Bistatic Synthetic Aperture Radar, Advanced Integrated Reference System, and Weapon System Demonstration are successful, the final phase of the program (Covert Strike Consolidated Demonstration) will begin in FY 1989. This provides a flight test of the "full-up" Covert Strike system including automatic target acquisition and classification, ultra-high resolution synthetic aperture radar imagery, and weapon delivery against tactical targets. The flight test will be completed in the 4th quarter of FY 1992.

c. (U) Milestones: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63106F
DOD Mission Area: #553 - Engineering Technology (ATD)

Title: Logistics R&D Requirements
Budget Activity: #6 - Defense-Wide Mission Support

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0	0	5,291	11,194	Continuing	N/A
2940	Computer Technology for Systems Design & Maintenance	0	0	3,896	8,506	Continuing	N/A
2950	Dormant Reliability Technology Development	0	0	1,395	2,688	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program will develop new computer-based technologies that will enable more reliable and maintainable weapon systems to be designed, and new technologies to improve maintenance and support for systems while reducing requirements for highly skilled maintenance personnel. Research tasks will include developing techniques to incorporate maintenance and logistics factors into computer-aided design, an integrated maintenance information system that incorporates technologies for improving maintenance diagnostics, and digital software architecture which will advance existing capabilities toward storage and retrieval of aircraft design considerations, design specifications, manufacturing methods and fabrication maintenance instructions. This program will also develop technologies to enhance the dormant reliability of weapon systems, such as smart weapons systems, which are being developed and when deployed will be placed in storage for extended periods prior to actual use. During the storage period, degradation of system components may occur rendering the system ineffective. To avoid this, the Air Force expends valuable resources for testing, inspecting and repairing the system to ensure full utilization and availability. Research tasks will perform study efforts to develop a complete dormant reliability data base addressing known problem areas, potential problem areas, and current methods used to reduce the effects of storage. Maintenance handbooks related to dormancy and storage effects will be developed from this data base. Research efforts will also perform testing and evaluation of new concepts that will improve the design, materials, health status monitoring and fault testing of weapons systems intended for long term storage.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: PE 63106F is a new start in FY 1984.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable

Program Element: #63106F | Title: Logistics R&D Requirements
DOD Mission Area: #553 - Engineering Technology (ATD) | Budget Activity: #6 - Defense-Wide Mission Support

5. (U) RELATED ACTIVITIES: Related program elements: 62201F, Aerospace Flight Dynamics; 78011F, Manufacturing Technology; 62205F, Training and Simulation Technology; and 73751F, Innovations in Education and Training; 62702F, Command, Control and Communications; 62203F, Aerospace Propulsion. There is a continuing interface and close coordination among the Army, Navy, and Air Force on Logistics research and development efforts to improve weapon systems reliability and maintainability. The Air Force Human Resources Laboratory as the Air Force Systems Command Laboratory focal point for logistics systems research, closely monitors all significant research and development being conducted by other Department of Defense, National Aeronautics and Space Administration, and industrial organizations to eliminate redundancy. The Computer Aided Design (CAD) efforts have been coordinated with the NASA Integrated Program for Aerospace Design (IDAP) and with the Department of Defense Manufacturing Technology Advisory Group (DOD-MTAG) through membership on their CAD/CAM subcommittee. The CAD efforts are also fully coordinated with the Integrated Computer Aided Manufacturing (ICAM) Program being accomplished under PE 78011F.

6. (U) WORK PERFORMED BY: This new program element will be managed by the Air Force Human Resources Laboratory (AFHRL), Brooks Air Force Base TX, through the Logistics and Human Factors Division (AFHRL/LR), Wright-Patterson Air Force Base OH. The initial work will be performed by AFHRL/LR, the Air Force Wright Aeronautical Laboratories (AFWAL), Wright-Patterson Air Force Base OH and the Rome Air Development Center, Rome NY. Both projects will require multilaboratory efforts with specific laboratory involvements varying from one year to the next.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 2940 - Computer Technology for Systems Design and Maintenance. The Air Force must develop technologies to improve the reliability, and maintainability (R&M) of weapon systems. This is the best done during the initial design and development phases of these systems, while the hardware design is still flexible. The goal of this effort is to enhance systems reliability while reducing the support complexity and requirements for skilled maintenance personnel. Currently the design process for new weapon systems does not have effective methodologies to consider R&M impacts of a hardware design concept during early design stages. This design inability also requires extensive testing efforts, and typically extensive and/or expensive predeployment modifications. Computer Aided Design (CAD) techniques have helped reduce the design burden making it possible to now consider logistics and R&M considerations during the initial design phases. Large amounts of R&M data are available to assist the design, but are unmanageable and not easily accessible in their current uncomputerized formats. Starting in FY 1984, this project will develop methodologies to expand CAD techniques to provide the means for early incorporation of R&M considerations into the design process. One task, Maintenance and Logistics in Computer Aided Design (MLCAD), will develop analytical models, computer software, data bases, and work procedures for including maintenance and logistics factors in the computer aided design of systems and equipment. The emphasis will be on the characteristics of equipment which enhance supportability in the field; for example improved fault isolation, reduced remove/replace time, more efficient battle damage repair, and quicker turn-around and servicing. A second task, the Integrated Design Support System (IDSS) will develop a digital software architecture which will advance

Program Element: #63106F
DOD Mission Area: #553 - Engineering Technology (ATD)

Title: Logistics R&D Requirements
Budget Activity: #6 - Defense-Wide Mission Support

A. Project: 2940 - Computer Technology for Systems Design and Maintenance. (Cont.) existing capabilities for the storage and retrieval of aircraft design considerations, design specifications, manufacturing methods, and fabrication maintenance instructions. This will be accomplished by developing an integrated computer aided manufacturing architecture so that lateral, as well as vertical, communications are encouraged and provided for between the different weapon subsystem design shops in a contracting organizational line structure. The digital information management and control disciplines will also be developed to force designer consideration of preselected "lessons learned" and require predetermined computerized coordination with other decision components for any design changes. Ultimately the IDSS, which will be initially created for each weapon system during the computer aided design and computer aided manufacturing processes, will be used by the Air Force for system logistics and maintenance support. It will provide a single digitized data base management and control system for each weapon system which will be capable of supporting near real-time, worldwide maintenance engineering requirements with computer terminals and graphic displays linked via telecommunications systems.

B. Project: 2950 - Dormant Reliability Technology Development. The Air Force must develop techniques and methodologies for guaranteeing that weapon systems which have been placed in storage for extended periods of time will function reliably when they are withdrawn from storage. The storage or dormant reliability of complex weapon systems such as the modern smart weapons, cruise missiles, etc., is a formidable problem because periodic testing of these weapons systems components, engines, motors, etc., requires highly skilled maintenance personnel and also shortens the effective weapon's life by contributing to the wear of various weapons system components. This project will develop new techniques for use in the design of systems, new materials, improved storage methods and non-destructive testing techniques, all of which will reduce or eliminate degrading factors associated with weapon system storage. New methodologies will also be developed for use in predicting and evaluating the reliability of weapon systems being removed from storage for combat use, in order to maximize the quick reaction capabilities of the Air Force through assured weapon system availability. Starting in FY 1984 the initial research efforts will develop a complete dormant reliability data base addressing known problem areas, potential problem areas, and current methods used to reduce the effects of storage. Future efforts will then develop design and maintenance handbooks for use by engineeers and technicians in reducing the impact of long term storage on weapons systems. In conjunction with the data base development, new technologies will also be developed as required for the design, materials, health status monitoring and fault testing of systems for dormant reliability.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63202F
DOD Mission Area: #553, Engineering Technology (ATD)

Title: Aircraft Propulsion Subsystems Integration (APSI)
Budget Activity: #2, Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	23,013	21,468	27,025	27,178	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for the design, development, and test of new techniques aimed at successful propulsion/airframe integration and compatibility, and improved installed performance in advanced aircraft. The scope of the program includes work on: (1) advanced inlet, fan, power turbine, engine control and nozzle components; (2) integrated testing of these components with advanced gas generators (i.e., Joint Technology Demonstrator engine); (3) methods to reduce engine life cycle cost; (4) definition of engine inlet/exhaust system installation design criteria and propulsion integration technologies; and (5) engine structural design criteria through hardware fabrication and test and improved engine stealth characteristics (infrared and radar cross section). Proper attention to the efforts under this program will provide aircraft systems with a potential for longer range, higher cruise speed with lower specific fuel consumption, surge power for successful engagements, high sortie rates with reduced maintenance, reduced life cycle cost and improved survivability in mission effectiveness.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	RDT&E	23,013	21,468	27,875		Continuing	Not Applicable

(U) Basic FY 84 Program was reduced by 4,114 to support higher priority programs. Resulted in reduction in durability testing to allow durability testing early in the life cycle. Additional funds, 3,500 in FY 84 and 9,000 in FY 85, were added to support DOD sponsored initiative for Electronic Reliability and Maintainability.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

5. (U) RELATED ACTIVITIES: The exploratory development base for this program is provided by Aerospace Propulsion Program Element 62203F, Materials Program Element 62120F, and Aerospace Flight Dynamics Program Element 62201F. Close technical coordination is maintained with the Air Force Flight Dynamics Laboratory, Aerospace Structural Materials Program, Program Element 63211F, and with the Air Force Materials Laboratory. This program is closely related to the Advanced Turbine Engine Gas Generator program, Program Element 63216F, which is managed from the same office and provides the core gas generator development efforts. This program is thoroughly integrated with the Navy component work under Program Element 63210N, Advanced Aircraft Propulsion Systems, which is developing compatible components for a cooperative Air Force/Navy demonstration of advanced engine technology. The Air Force and the Navy currently have a formal Memorandum of Understanding covering efforts under the Joint Technology Demonstrator Engine (JTDE) program. Close coordination is maintained with related efforts conducted by the Army and National Aeronautics and Space Administration.

Program Element: #63202F | Title: Aircraft Propulsion Subsystems Integration (APSI)
DOD Mission Area: #553, Engineering Technology (ATD) | Budget Activity: #2, Advanced Technology Development

6. (U) WORK PERFORMED BY: This program is managed by the Air Force Aero Propulsion Laboratory, Wright-Patterson AFB, OH. The current contractors involved in this program and their work areas are: Boeing Military Airplace Co., Seattle, WA (Integrated Propulsion Systems Concepts); Detroit Diesel Allison Division of General Motors, Indianapolis, IN (Advanced Fan Aerodynamics, Joint Technology Demonstrator Engine, Reduced Cost Concepts); Garrett Turbine Engine Company, Phoenix, AZ (Low Cost Component Development); General Electric, Evendale, OH (Joint Technology Demonstrator Engine, Variable Cycle Engine, Reduced Cost Components, Structural Methodology); McDonnell Douglas, St Louis, MO (Inlet/Aircraft Drag Investigation, Propulsion Simulator); Pratt & Whitney Aircraft, West Palm Beach, FL (Variable Cycle Engine, Structural Design Criteria, Joint Technology Demonstrator Engine); and Teledyne CAE, Toledo, OH (Low Cost Component Development, Joint Technology Demonstrator Engine, Structural Methodology).

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 84: Not Applicable.

8. (U) PROJECTS OVER $10 MILLION IN FY 84:

(U) Aircraft Propulsion Subsystems Integration (APSI)

A. (U) Project Description: This program provides for the development and functional demonstrations for those advanced technologies which are necessary to assure propulsion and airframe compatibility, and permit the attainment of advanced performance objectives in future aircraft systems. The scope of this program includes: (1) the development of advanced components related to inlets, fans, power turbine, augmentors, controls and exhaust nozzles; (2) the overall integration of these components with the basic advanced gas generators to form a demonstrator engine to define the flowpath and assess the durability/life aspects of the engine concepts; (3) the development of methods to reduce engine life cycle costs by 20-25 percent; (4) the definition and verification of the methodology to structurally design, analyze, and test turbine engines to achieve increased engine durability; and (5) the definition of improved inlet/engine/exhaust system installation design criteria and propulsion integration techniques, and (6) the development of improved engine stealth characteristics through the reduction of infrared and radar cross section signatures. The components being developed will provide the basis for 10-20 percent reduction in specific fuel consumption, 10-15 percent increase in stall margins, 15-20 percent reduction in engine weight, increased life/durability, 15-30 percent reduction in engine life cycle cost and greater airflow matching potential when compared to the most modern engines currently in the inventory. These benefits can be traded off against one another to meet the specific needs of systems of interest. This program provides both the critical technology baseline for future system development and a source of data for ensuring the orderly resolution of any propulsion system problems encountered with development engines.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Seven contractual efforts, previously begun, have been completed. The reduced cost program culminated with the performance verification testing of selected components. These programs confirmed that reduced cost components can be successfully fabricated and rig tested to verify that components specifically designed to reduce life cycle cost by 10-30 percent can withstand the engine operating conditions. The structural design and development programs were completed with comprehensive environmental rig testing which will run the selected components to full life. The test results were used to verify that predicted failure modes and durability can be accurately predicted, verified and utilized in subsequent design practice. The initial advanced exhaust materials effort was com-

pleted with an engine test which provided an evaluation of the material in a realistic slave engine environment as well as evaluation of selected infrared (IR) suppression devices. Advanced nonaxisymetric nozzle assessment was completed with evaluation of air-to-ground and air-to-air application wind tunnel tests. This program provided the effects of nozzle design options on aircraft drag reductions. The propulsion simulator effort was completed and provided capability for more cost-effective wind tunnel testing. In the Joint Technology Demonstrator Engine (JTDE) program initial performance testing was completed on the first fully variable cycle JTDE. This test established the high spool/low spool interactive effects as well as the variable cycle effects. Two extended performance/structural tests were completed on the small engine JTDE. The Variable Cycle Technology programs completed hardware fabrication and preparation for testing in a slave engine demonstrator. In addition, current efforts include (a) JTDE Accelerated Durability Assessment Configuration (ADAC) Experimental Accelerated Mission Testing (XAMT); (b) Life Cycle Cost/Damage Tolerance Assessment; and (c) Advanced Exhaust System Materials Demonstration. The JTDE ADAC XAMT testing will provide extensive durability assessment through severe testing in a complete engine demonstrator. This program will permit earlier extensive durability assessment of selected key JTDE component technologies. The Advanced Exhaust System Materials program will provide evaluation of full application of advance materials in the augmentor and nozzle culminating in a slave engine test. The Life Cycle Cost/Damage Tolerance Assessment will develop a damage tolerant design system and provide a life cycle cost evaluation of it applied to hot section components. Four new efforts were initiated in FY 82: (a) Integrated Propulsion System Control development, which will develop the technology for integrated control systems with expanded aircraft flight control requirements, (b) Advanced Applications/LCC Analysis, which will provide trade-off data to be used in identifying critical technologies to be demonstrated in the APSI program for the next generation propulsion systems, (c) Integrated Propulsion System Concepts, which will determine engine/airframe integration and compatibility characteristics of highly integrated designs, particularly those applicable to V/STOL and stealth advanced aircraft, and (d) Engine Durability Assessment, which will assess durability characteristics of fan/compressors when operating in conjunction with high pressure distortion inlets, such as those with low radar cross section signatures.

(2) (U) FY 1983 Program: Efforts during this time frame will continue to concentrate on the JTDE test assessment area. Follow-on contracts will be awarded with initial performance testing to be conducted on one large engine JTDE. Initial cycle endurance testing will be conducted on a large engine and small engine JTDE. Two large engine JTDE Accelerated Durability Assessment Configurations (ADAC) will complete their second Experimental Accelerated Mission Tests (XAMT) using life assessment testing philosophy and a small engine JTDE ADAC will complete similar testing. Component selection, design and fabrication using damage tolerant design criteria will be completed on selected components. The propulsion simulator for highly integrated systems will be fabricated for wind tunnel model tests. Piggyback tests will be conducted for engine environmental data on selected hot section components in the Engine Durability Assessment program. Fabrication of the advanced exhaust system with advanced materials will be completed in preparation for high performance turbofan slave engine testing. One new effort will be initiated: Advanced Augmentor, to provide technology transition into the JTDE of afterburner technology of advanced tactical systems.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Efforts during this time period will continue on the JTDE test assessment. Emphasis will be placed on durability testing of the XAMT type, and initial operability testing at simulated altitude conditions. Efforts will be initiated in the reduced observables area (IR and RCS signatures) depending on outyear funding. In addition, efforts will be continued in the engine/airframe integration area, specifically in the advanced exhaust nozzle material applications area, and the integrated propulsion system con-

cepts area. Two new start efforts will be initiated: (a) Advanced Exhaust Nozzle Technology Integration, which will integrate advanced materials, thrust vectoring/reversing capabilities, and low signatures in exhaust nozzle designs for subsequent engine test, and (b) Advanced Material (Eutectic) Turbine, to demonstrate life/durability of turbine design for long life, supersonic cruise applications. Work will be performed in support of DOD initiative on Electronic Reliability and Maintainability. Preliminary design and fabrication of a reliable, fault-tolerant engine control will be initiated based on earlier design/trade study. Level II Joint Technology Demonstrator Engine (JTDE) efforts incorporating extended performance verification and structural/diagnostic test and evaluation will be continued. Altitude performance assessment will be conducted on an engine JTDE. JTDE Accelerated Durability Assessment Configuration (ADAC) vehicles will be subjected to Experimental Accelerated Mission Testing (XAMT). A piggyback engine test will provide final verification of a life cycle cost model previously developed. Critical variable cycle engine technology demonstrations will focus on verification of operating characteristics through slave engine and rig tests at sea level and altitude conditions. This request will provide for: (1) altitude performance test assessment, Level II structural/diagnostic test, extended performance characterization test, and life assessment testing of large engine JTDEs, (2) exhaust system infrared signature reduction and control concept model testing and analysis (3) piggyback engine test of component designed for reduced life cycle cost, (4) rig/environmental test of an advanced composite fan and, (5) continuation of integrated control system development efforts. Initiation of technology efforts for reduced engine observables (radar cross section) will be delayed due to funding constraints. The cost estimates for this program are based upon contractual commitments which extend through early FY 1985 plus historically backed cost estimates for a level of effort testing which is included in the APSI Five Year Plan as directed by the APSI Program Management Directive.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63203F — Title: Advanced Avionics for Aircraft
DOD Mission Area: Electronic and Physical Sciences, #551 — Budget Activity: Advanced Technology Development, #2

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	14,944	17,201	25,280	24,877	Continuing	N/A
666A	Advanced Reference Systems Development	3,380	3,497	4,604	2,300	Continuing	N/A
69CK	Advanced Devices	2,750	3,500	6,026	8,282	Continuing	N/A
69DF	Advanced Weapon Delivery	6,084	5,004	5,550	4,900	Continuing	N/A
2733	Advanced Reconnaissance/ Strike Radar	2,730	5,200	9,100	9,395	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The threat posed by the Warsaw Pact is steadily increasing in both quantity and quality. To establish a capability to successfully contend with the threat postulated for the mid to late eighties, our forces require significant improvements in the performance provided by aircraft avionics. This program element is the principal Air Force source of advanced technology for avionics that accomplish the navigation, target acquisition, weapon delivery, and fire control functions.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	14,944	18,201	22,556		Continuing	N/A

FY 83 funding request reduced by Congressional action. FY 84 and FY 85 request increased to provide concentrated efforts on reliability and maintainability for avionic systems.

4. (U) OTHER APPROPRIATION FUNDS: None

5. (U) RELATED ACTIVITIES: The exploratory development for this program is PE 62204F, Aerospace Avionics. Efforts transitioned include work on solid state active aperture arrays for high reliability airborne radars, a family of standard high speed analog-to-digital converters for avionics subsystems, and an advanced multiple target attack fire control system using synthetic aperture radar weapon cueing. Additional work includes the Integrated Inertial Reference Assembly to satisfy flight control, fire control and navigation inertial sensor requirements in a single subsystem.

Program Element: #63203F Title: *Advanced Avionics for Aircraft*
DOD Mission Area: Electronic and Physical Sciences, #551 Budget Activity: Advanced Technology Development, #2

6. (U) WORK PERFORMED BY: The Air Force Wright Aeronautical Laboratory/Avionics Laboratory Wright Patterson AFB, OH, under the overall management of the Air Force Systems Command, manages the projects in the Advanced Avionics for Aircraft program. Contractors include: General Electric, Westlynn, MA, and Binghamton, NY (Proj 69DF, 69CK); Environmental Research Institute of Michigan, Ann Arbor, MI (Proj 2733); Westinghouse Electric Corp, Baltimore, MD (Proj 2733); Harris Corp, Melbourne, FL (Proj 666A); and TRW Crop, Lawndale, CA (Proj 666A, 69CK). An additional 14 contractors/universities are under contract for $10.2M of R&D efforts.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 84

A. (U) Project 666A, Advanced Reference System Development is developing very accurate reference sensors (gyros, accelermeters, receivers) for cruise missiles, strategic aircraft and fighters to improve weapon delivery and stealthy operations. In FY 82, work on the Integrated Inertial Reference Assembly preliminary design was completed. This effort seeks to reduce by two thirds the number of inertial sensors required on fighters, increase mean time between failures to 2000 hours and decrease reaction time from 10 minutes to 3 minutes. Final design and fabrication begins in FY 83 and continues in FY 84. Work on the joint Air Force/Navy development of a high accuracy ring laser gyro to increase cruise missile strike capabilities and provide motion compensation for advanced sensors will continue. The Adaptive Multifunction Antenna effort will be completed in FY 84. This program provides the technology needed to reduce the number of antennas needed on fighters by sharing high anti-jam antennas for multiple signal processing.

B. (U) Project 69CK, Advanced Devices, supports study of key electronic devices to hasten transition from feasibility to systems application. Specific areas are chosen where improvements in performance, cost and reliability will improve the quality, capability or life cycle costs of Air Force systems. In FY 82, the project completed development of measurement techniques in the 75-110 GHz frequency range for the National Bureau of Standards which are critical for future work in the high frequency end of the millimeter wave region. In FY 83, work will finish on an X-Band Coupled Cavity Radar traveling wave tube which provides the performance of current amplifier chains while reducing size, weight, and cost penalties. Also ending is development of a high power gallium arsenide IMPATT combiner. This solid state amplifier offers significant advantages in weight, volume, reliability and power requirements for missile radar sensors. In FY 84, work will continue on the solid state phased array radar and reliable high current power supply which is a critical element in an advanced airborne radar with an order of magnitude improvement in reliability. Development of a flight qualified high power agile laser source for recce/strike and electronic warfare application will continue. A carbon dioxide laser radar source for use in laser radars and weapon system delivery applications will continue in development. The magnetic bubble, high density memory system for airborne and spaceborne systems will be completed.

Program Element: #63203F Title: Advanced Avionics for Aircraft
DOD Mission Area: Electronic and Physical Sciences, #551 Budget Activity: Advanced Technology Development, #2

C. (U) Project 69DF, Advanced Weapon Delivery, improves the mission effectiveness of Air Force combat aircraft by extending the operational capability of both air-to-air and air-to-ground weapon delivery systems. It develops sensors, components, subsystems and techniques to improve weapon delivery while enhancing survivability. The work includes new algorithms and integration techniques to reduce pilot workload while significantly enhancing man/machine information transfer. In FY 82 work was completed on an advanced air-to-air missile launch envelope (MLE) algorithm and this project's share of the integrated flight/fire control (IF/FC) system. The MLE work has demonstrated a 25% reduction in out-of-bounds missile launches and a 25% decrease in missed missile firing opportunities. It will be installed in the F-16 Multi-Stage Improvement Program aircraft beginning in FY 84. The IF/FC effort has demonstrated its expected 3:1 increase in firing opportunities in air-to-air gunnery. In FY 83, work on adapting the MLE algorithm technology to the AMRAAM class of missiles will be largely completed. In FY 84, flight tests on the Infrared Search and Track System (IRSTS) will begin. The IRSTS, combined with existing intercept radars, will provide the Air Force with a greatly increased interception capability against high speed, low radar cross section threats. Work on the Multiple Attack Concepts Evaluation will continue. This effort uses Synthetic Aperture Radar and RF cueing as the basis for a much improved all-weather standoff fire control system for advanced air-to-ground missiles to enable multiple kills per pass. Work also continues on the application of advanced target acquisition sensors such as FLIR, CO_2 laser radar and millimeter wave radar to improved day/night and adverse weather fire control.

D. (U) Project 2711, Advanced Reconnaissance/Strike Radar, develops new radar system concepts for improved reliability, target detection, acquisition, location and classification. Real time radar signal processing, target detection and classification, countermeasures insensitivity, passive/active target acquisition and system survivability are key technology objectives. This project got underway in FY 82 with work on Low Probability of Intercept Terrain Following (LPI TF) techniques and Slow Ground Moving Target Indication/Location (SGMTI/L) analysis and simulation. The LPI TF effort offers enhanced penetrating aircraft survivability by substantially reducing radiation coming from the aircraft. The SGMTI/L efforts are exploring synthetic aperture radar techniques to find targets which conventional MTI techniques miss. Both efforts will transition to the Monostatic Integrated Radar Demonstration for flight testing. In FY 83, work on the radar aided mission/aircrew capability exploration will conclude having evaluated the capabilities provided by different levels of radar target acquisition automation in one and two man cockpits. In FY 84, the two major efforts in the project, Monostatic Integrated Radar Demo and Solid State Phased Array Radar, will continue. The MIRD effort is designed to flight test an ultra-high resolution synthetic aperture radar equipped with LPI TF and SGMTI/L capabilities. This technology is geared to satisfy TAC's airborne tactical all-weather strike operational requirement (TAF COR 304-78) The Solid State Phased Array Radar is being jointly pursued with Project 69CK, Advanced Devices, to provide the technological foundation for an order of magnitude improvement in radar system reliability.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63205F   Title: Flight Vehicle Technology
DOD Mission Area: #553 - Engineering Technology (ATD)   Budget Activity: #2 - Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	9,055	7,301	15,039	22,157	Continuing	N/A
2506	Control of Flight	8,855	5,801	6,939	11,657		
2507	Vehicle Equipment	200	1,500	2,800	2,300		
2978	Reliability and Maintainability for Flight Vehicle Technology			5,300	8,200		

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program will develop new highly reliable and maintainable aeronautical technologies for transition to current and future Air Force weapon systems. Technologies investigated include enhanced flight control and weapons delivery systems for Air Force fighters, systems for reduced maintenance cost, increased aircraft survivability/reliability, and systems for increased aircraft fuel efficiency/range. Part of this program develops the aeronautical technologies to be integrated and demonstrated in PE 63245F, Advanced Fighter Technology Integration (AFTI), under project 2061, Fighter Attack Technology (AFTI/F-16), and Project 2682, Short Takeoff and Landing (STOL) Fighter Technology. Hardware and software development of the Automated Maneuvering Attack System for the AFTI/F-16 testbed aircraft will be completed. In PE 63245F the technologies comprising the Automated Maneuvering Attack System will be demonstrated on the digitally controlled AFTI/F-16 test vehicle to validate the concept of single seat, low altitude, maneuvering attack against heavily defended ground targets and increased firing opportunities realizable in air-to-air combat. Atmospheric Electricity Hazards Protection system criteria development will be completed in preparation for actual ground test evaluation of these criteria on advanced testbed aircraft. Initiates design of integrated flight/propulsion control system and advanced pilot vehicle interface program for the ATF related STOL program. A separate project will focus its attention on improving the reliability and maintainability of products being developed within this program element.

3. (U) COMPARISONS WITH FY 1983 DESCRIPTIVE SUMMARY:

6,675	7,301	9,979		Continuing	N/A

A. FY 1982 - Project 2506, Control of Flight; 2,380K increase in the Integrated Flight/Fire Control (IFFC) F-15 program due to repair of damaged flight test hardware and increase in flight test cost resulting from this delay. FY 1984 - Project 2978, Reliability and Maintainability for Flight Vehicle Technology; 5,300K was added to support DOD sponsored initiative for Reliability and Maintainability.

Program Element: #63205F — Title: Flight Vehicle Technology
DOD Mission Area: #553 - Engineering Technology (ATD) — Budget Activity: #2 - Advanced Technology Development

4. (U) OTHER APPROPRIATION FUNDS: Not applicable.

5. (U) RELATED ACTIVITIES: This program is developing the Automated Maneuvering Attack System (AMAS) and the STOL control system for demonstration in PE 63245F, Advanced Fighter Technology Integration (AFTI). The AFTI program, in turn, provides technology options for PE 63230, Advanced Tactical Fighter. The Advanced Tactical Fighter program is expected to incorporate a menu of advanced technologies in the design of the next generation fighter. The Digital Flight Control System being developed under this PE and flight validated on the AFTI F-16 test vehicle under PE 63245F during FY 1983 is jointly funded by Navy. The Atmospheric Electricity Hazards Protection (AEHP) program is a joint development with the Army, Navy, National Aeronautics and Space Administration, Defense Nuclear Agency, and the Federal Aviation Administration. It will be carried out in consonance with an approved Interagency Management Plan. The Integrated Inertial Reference Assembly (IIRA) program is jointly funded by the Air Force Wright Aeronautical Laboratories Avionics Laboratory (PE 63203F) with the Avionics Laboratory as lead.

6. (U) WORK PERFORMED BY: This program is managed by the Flight Dynamics Laboratory, Wright Aeronautical Laboratories, Wright-Patterson Air Force Base, OH. Flight testing of the F-16 testbed vehicle will be accomplished at the Air Force Flight Test Center under an approved Statement of Capability. The contractor is General Dynamics Corporation, Ft. Worth, TX. The McDonnell Douglas Corporation, St. Louis, MO is the prime contractor for the conventional Integrated Flight/Fire Control I development on the AFTI F-15 testbed. The AEHP program is under contract to The Boeing Aircraft Company, Seattle, WA.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 2506, Control of Flight. Exploratory development efforts performed during past years have identified a number of promising aeronautical technologies that offer large improvements in capability and survivability over current fighter systems. In order to provide systems developers the assurance needed to build tactical combat aircraft using these advanced technologies, the laboratory developments must be validated in flight. Project 2506, Control of Flight, develops several of these technologies for flight testing. An Integrated Flight/Fire Control I System was developed for aircraft equipped with a conventional flight control system and flight tested on an F-15 test vehicle. A Digital Flight Control System and pilot vehicle control and display interfaces developed under the project are now being flight demonstrated in the Advanced Fighter Technology Integration F-16 test vehicle under PE 63245F, Advanced Fighter Technology Integration (AFTI). The Digital Flight Control System, in conjunction with additional control surfaces on the AFTI/F-16 will provide independent six degree-of-freedom control and the capability to task-tailored the flight control laws to the aircraft mission. Additionally, this project will develop an integrated flight/fire control system, a Forward Looking Infrared (FLIR) sensor/tracker, and other technologies for integration during the Automated Maneuvering Attack System (AMAS) phase of the AFTI/F-16 program. The Integrated Flight Propulsion System and Advanced Pilot Vehicle Interface will be developed as a part of the STOL program and flight tested under PE 63245F.

(1) (U) FY 1982 Program: Development testing of the conventional Integrated Flight/Fire Control Program on the F-15 test vehicle culminated with a feat in air weaponry--the kill of a F-102 drone from the front quarter at a range of 5,000 feet in maneuvering flight. AFTI/F-16 first flight was in July 1982. Testing of the Digital Flight

Control System developed under this program element, has met all objectives successfully. The Automated Maneuvering Attack system design continued throughout the fiscal year.

(2) (U) FY 1983 Planned Program: Development and fabrication of the Integrated Flight/Fire Control system, the FLIR sensor/tracker with laser designator, and the helmet mounted sight for the Automated Maneuvering Attack System (AMAS) portion of the F-16 testbed demonstration will continue throughout FY 1983. An operational type evaluation will be accomplished by AF and Navy using command pilots.

(3) (U) FY 1984 Planned Program: Initiate a program in Integrated Flight/Propulsion Control to provide the necessary controls and displays to accomplish a Short Take-off and Landing (STOL) capability. This technology will directly support the STOL Fighter Technology project in PE 63245F, Advanced Fighter Technology Integration. Support for the flight control portion of the Integrated Inertial Reference Assembly (IIRA) development will continue. The IIRA system is much smaller, more dependable, and more survivable from battle damage than the processors currently needed to accomplish navigation and weapons delivery. Complete support of the Automated Maneuvering Attack System for the F-16 test vehicle.

B. Project: 2507, Vehicle Equipment. Atmospheric Electricity Hazards Protection (AEHP) is the current program funded under this project. The AEHP program will address the lightning and electromagnetic interference hazards to new generation aircraft caused by widespread use of sensitive microelectronic systems and advanced composite materials. The AEHP program will be conducted in two phases: Phase I will establish preliminary hardening design criteria, methodology, selection and design of hardening concepts for the testbed aircraft; Phase II will demonstrate optimized hardening measures of electrical/electronic subsystems on the testbed aircraft.

(1) (U) FY 1982 Program: Preliminary design phase completed.

(2) (U) FY 1983 Planned Program: The detail design will be completed in the AEHP program. The design will incorporate criteria developed in the vulnerability assessment.

(3) (U) FY 1984 Planned Program: Phase II of the Atmospheric Electricity Hazards Protection program will begin in late FY 1984. Phase II of the program encompasses the design and fabrication of the testbed aircraft electronics with hardened advanced microelectronic circuitry and advanced composite structures.

C. Project: 2978, Reliability and Maintainability for Flight Vehicle Technology. This project will do the analysis, design, and component testing to demonstrate improved system tolerance to faults and failures of digital flight and power control system components. Fault tolerance is accomplished by using redundant software elements and time staggering of these computer operations. This inherent self-checking characteristic will demonstrate the effects of hidden software faults and decreased development and testing time. It will develop methods to use the inherent computing power of digital systems to provide automatic diagnostics and maintenance action reporting which will improve reliability and reduce ownership costs. The computational speed and expanded memory of digital flight control systems will be combined with predictive software techniques to enhance the system's ability to detect faulted or damaged elements and indicate how to fix them. The ability to reconfigure around a faulted system to reduce maintenance time will be demonstrated. Verification will be accomplished in the AFTI/F-16 and STOL Demonstrator programs. The project will develop software for microprocessor environmental control that will manage the cooling distribution to individual assemblies of an aircraft electronics suite. During the course of a flight it will direct available coolant flow assuring mission critical components receive priority cooling when needed. Selected electronics assemblies with a cooling distribution system using sensors, valves, and controllers will be test flown on the AFTI/F-16 and STOL Demonstrator aircraft. The project will also develop and test a dynamic diagnostic function for the Integrated Inertial Reference Assembly (IIRA) to provide the capability for detecting faults that cannot be found during ground testing. An appropriate gyro sensor and fault tolerant processing configuration together with software must be developed to isolate the faulty mode and provide the mechanism for detecting these failures in-flight. The gain in system safety and reliability may eliminate the need for aircraft intermediate shops thereby decreasing maintenance time and costs. Output will be design guidelines and criteria to update military standards and specifications.

(1) (U) FY 1982-1983 Program: No activity in this project, but other projects in this program element developing the basic technology for which reliability and maintainability will be improved by this project.

(2) (U) FY 1984 Planned Program: Develops and tests individual components to be integrated and flight tested in PE 63245F. Subsystem and component testing will be initiated. Supports integration of more mature components and software during flight test.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63208F
DOD Mission Area: #551 - Electronic and Physical Sciences (ATD)

Title: Reconnaissance Sensors/Processing Technology
Budget Activity: #2 - Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	4,085	4,600	7,738	10,493	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Continue development of automatic real-time targeting capability for reconnaissance and strike missions in day, night and adverse weather conditions and in countermeasure environments. The emphasis is to improve time responsiveness and capability of sensors and processing systems in order to provide real and near real-time information to tactical commanders for effective strike and surveillance of mobile and stationary enemy forces. The program provides the technology base and concept validation for advanced sensor systems, with both airborne and ground-based processing, for expeditious detection, location and classification of targets concealed by camouflage, foliage, adverse weather or darkness.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	4,085	6,383	8,984		Continuing	N/A
Procurement	Not Applicable					

4. OTHER APPROPRIATION FUNDS: Not Applicable.

5. (U) RELATED ACTIVITIES: Exploratory development efforts are phased into this program from Program Element (PE) 62204F, Aerospace Avionics. Equipment developments from this program are transitioned into engineering development PEs such as 64710F, Reconnaissance Equipment; 63249F, Night Attack; 64249F, Night Precision Attack (LANTIRN) System; and will provide the sensor/processing technology for the Advanced Tactical Air Reconnaissance System. Coordination with the Army and Navy on related advanced development work is accomplished by direct liaison between corresponding levels of program management and through the Joint Deputies for Laboratories Sub-Panel on Night Vision. Joint Air Force/Navy testing is planned to evaluate advanced sensors for both Air Force and Navy missions. PE 63727F, Advanced Communication Technology, is developing the associated Airborne Imagery transmission data link required to provide timely reconnaissance information to Tactical Commanders.

6. (U) WORK PERFORMED BY: Program management is the responsibility of the Air Force Systems Command through the Air Force Avionics Laboratory, Wright-Patterson Air Force Base, OH, with participation of the Rome Air Development Center, Griffiss AFB, NY. Major contractors are: Hughes Aircraft Co., El Segundo, CA, for Second Generation FLIR Technology

Program Element: #63208F
DOD Mission Area: #551 - Electronic and Physical Sciences (ATD)

Title: Reconnaissance Sensors/Processing Technology
Budget Activity: #2 - Advanced Technology Development

6. (U) WORK PERFORMED BY: (Continued)

Demonstration; Harris Corp., Melbourne, FL, for ground based data processing (Data Handling/Recording System); Rockwell International Corp., Anaheim, CA, and Honeywell, Inc., Minneapolis, MN, for FLIR imagery processing (Imaging Sensor Autoprocessor).

7. (U) PROJECT 665A, Reconnaisance Sensor/Processing Technology (PROJECT LESS THAN $10 MILLION IN FY 1984).

(A) (U) Project Description: This single project contains all advanced development activities and provides the technology base for new and improved reconnaissance sensors and real-time imagery processing systems. This technology development will provide a capability to rapidly detect, locate and classify moving and stationary targets day or night in adverse environmental conditions. This capability is critically needed to provide real-time and near real-time reconnaissance information to tactical commanders under fast moving battle conditions as well as to improve strike mission capability and survivability while reducing pilot workload. Specific major development efforts include:

The Advanced Target Acquisition Sensor Program to demonstrate and flight test validate the Second Generation Forward Looking Infrared (FLIR) sensor and autoprocessor system. This system provides twice the range and target resolution of current FLIR sensors as well as automatic, real-time target detection and classification.

A major data collection effort managed through this project to acquire high quality infrared imagery data needed for DOD and industry wide test and evaluation of automatic target recognizer systems and algorithms. Both tower and airborne data collection systems, using high resolution equipment developed by the Army, will be employed to acquire these data which will be utilized by all three Services and DOD contractors as a standardized infrared imagery data base.

Automatic target recognizer systems to replace manual interpretation/exploitation of reconnaissance information. This task includes development of an advanced autoprocessor system based on technology developed for electro-optical imagery processing but extended to have a dual capability to automatically detect targets from radar data and then automatically classify those targets as to type using imagery from infrared (FLIR) sensors. This system will use Very High Speed Integrated Circuit (VHSIC) technology.

A ground-based Data Handling and Recording System for high speed, high volume imagery processing. The system will provide a capability for near real-time exploitation of reconnaissance information and will also be equipped to serve as a central station for evaluation and comparison for competing automatic target recognizer systems under simulated operational conditions for all military applications.

All-weather target detection radar with the capability to automatically detect targets masked by camouflage and foliage.

Program Element: #63208F
DOD Mission Area: #551 - Electronic and Physical Sciences (ATD)

Title: Reconnaissance Sensors/Processing Technology
Budget Activity: #2 - Advanced Technology Development

7. (U) PROJECT 665A, Reconnaisance Sensor/Processing Technology (PROJECT LESS THAN $10 MILLION IN FY 1984) (Continued)

(A) (U) Project Description: (Continued)

Carbon Dioxide laser systems which will provide a significantly improved reconnaissance mission capability as well as multi-target tracking and multiple weapons guidance capability for strike missions. This technology will also provide automatic terrain following and terrain avoidance for low-level penetration missions.

(B) (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Continued Data Handling and Recording System development and Automatic Target Recognizer System development. Completed demonstration of advanced focal plane array for the Second Generation FLIR system. Started the Advanced Target Acquisition sensor program, and the high quality infrared imagery data collection program.

(2) (U) FY 1983 Program: Continue development of the Automatic Target Recognizer Systems including initial demonstration of an autoprocessor using advanced algorithms. Complete fabrication and begin demonstration of the Data Handling and Recording system. Continue Brassboard fabrication for the Advanced Target Acquisition Sensor Program.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The Advanced Target Acquisition Sensor program will continue under contract with Hughes Aircraft Corp, El Segundo, CA. FY 1984 funding required for this effort, based on firm contractual agreements, is $3.2 million. These funds will provide for laboratory and tower testing of the brassboard system and aircraft integration in preparation for flight test demonstration in FY 1985. Transition to Engineering Development will occur in late FY 1985.

Development of an advanced autoprocessor system, using Very High Speed Integrated Circuit (VHSIC) Technology, will start in FY 1984. Planned FY 1984 funding for this effort is $3.1 million based on past experience in developing autoprocessor systems. These funds will provide for design and initial fabrication of a system based on technology developed for electrooptical imagery processors with the added capability to process radar data for target detection. This effort is a key VHSIC Technology Insertion program scheduled for completion in FY 1986. Development of advanced algorithms for Automatic Target Detection and classification will also continue under this effort.

Advanced development of CO_2 laser systems for reconnaissance and strike missions will start in FY 1984. The system will build on technology currently under development for multi-target track, multiple weapons guidance as well as navigation and terrain following for manned and unmanned low-level penetration mission. FY 1984 funding for this effort and an associated CO_2 laser imagery data collection program will be $1.5 million. This program is planned to continue through FY 1989, but as technology is successfully demonstrated, it will be transitioned to appropriate Engineering Development programs.

Program Element: #63208F — Title: Reconnaissance Sensors/Processing Technology
DOD Mission Area: #551 - Electronic and Physical Sciences (ATD) — Budget Activity: #2 - Advanced Technology Development

7. (U) PROJECT 665A, Reconnaisance Sensor/Processing Technology (PROJECT LESS THAN $10 MILLION IN FY 1984) (Continued)

(B) (U) Program Accomplishments and Future Efforts: (Continued)

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: (Continued)

Another new effort will start development of special long wavelength radar which will have the unique capability to detect military targets concealed by foliage and camouflage. This system will augument electro-optical sensors and will provide a major advance in all-weather, long-range reconnaissance capability. Planned FY 1984 funding for this effort is $0.3 million. The effort will continue through FY 1987.

An effort to provide a ground-based Data Handling and Recording system under contract with Harris Corp, Milburne, FL will be completed in FY 1984 with final on-site checkout and acceptance. The system will provide the technology and demonstrate the capability for near real-time (less than 5 minutes) exploitation of reconnaissance information. It will also be used for checkout and evaluation of prototype automatic target recognizer system under simulated airborne conditions. Funding in FY 1984 to complete this effort will be $0.6 million.

(4) (U) Program to Completion: This is a continuing program.

(C) (U) Major Milestones:

	Milestone	Date
(1)	Complete Data Handling/Recording System for Near Real-time Reconnaissance Data Exploitation	June 1984
(2)	Complete Advanced Target Acquisition Sensor Program to Flight Test Demonstrate Second Generation FLIR Sensors	July 1985
(3)	Complete Advanced, Multi-mode Automatic Target Recognizer Using VHSIC Technology	September 1986
(4)	Complete Initial Co_2 Laser Advance Development Effort for Reconnaissance Weapon Delivery and Navigation	April 1986
(5)	Complete Foliage Penetration Radar Development for All-weather Reconnaissance	March 1987

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63211F Title: Aerospace Structures and Materials
DOD Mission Area: #553 - Engineering Technology (ATD) Budget Activity: #2 - Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	18,497	22,545	22,762	16,485	Continuing	N/A
69CW	Advanced Composites	6,727	8,045	6,962	2,985		
486U	Advanced Metallic Structures	6,400	7,100	8,500	8,000		
2100	Laser Hardened Materials	5,370	7,400	7,300	5,500		

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This is the only Air Force program which demonstrates the application of new materials, advanced structural design concepts, new fabrication technology, and hardening techniques against high energy laser threats to Air Force systems, subsystems, and components. Metallic, nonmetallic, and laser hardened structures and components are designed and fabricated with advanced materials and new design/fabrication technology and tested to complete the technology validation process. The result is a demonstrated capability with improved structural integrity, damage tolerance, and durability, ready for weapon systems application. Direct benefits are reduced systems cost, weight and technical risk along with increased systems performance and survivability.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

		19,427	23,545	25,610		Continuing	N/A

The difference in the FY 1984 estimate is due to reduced effort in projects 486U and 69CW. The Visco-elastic Damping for Space Structures program and the Powder Aluminum Technology program in project 486U were reduced by $1.2M. The remaining $1.7M difference is attributable to deletion of programs in the optical surveillance structure program, the survivable maneuvering satellite structures effort, selected carbon/carbon efforts, and the advanced strategic missile structures program.

4. (U) OTHER APPROPRIATION FUNDS: Not applic ble.

5. (U) RELATED ACTIVITIES: Coordination with other Department of Defense and governmental activities is maintained under strong guidance of the Office of the Secretary of Defense's technical staff. Activities such as the Tri-Service Metal-Matrix Composite Steering Group, the Tri-Service Laser Hardening Materials and Structures Working Group, and bi-annual Department of Defense Materials and Structures Conference foster development of a strong, nonredundant program. Close relationships are maintained with the National Aeronautics and Space Administration in areas of mutual interest. This program element is meshed with portions of the Air Force Manufacturing Technology Program (Program Element 78011F), with results of each program element feeding the other; with Aerospace Flight Dynamics

Program Element: #63211F Title: Aerospace Structures and Materials
DOD Mission Area: #553 - Engineering Technology (ATD) Budget Activity: #2 - Advanced Technology Development

(Program Element 62201F), Materials (Program Element 62102F), and Aerospace Propulsion (Program Element 62203F) each of which provide the basic technology for further development within this program element. It also interfaces with the Advanced Radiation Technology (Program Element 63605F) and Satellite Systems Survivability (Program Element 63438F) programs which support and benefit from the laser hardened materials effort. Due to the universal nature of materials and structures and their application, this program element has potential application for essentially every major Air Force acquisition program.

6. (U) WORK PERFORMED BY: This program is managed by the Air Force Wright Aeronautical Laboratories' Flight Dynamics and Materials Laboratories, Wright-Patterson Air Force Base, OH. The major contractors of the program include: General Electric Company, Evendale, OH and Philadelphia, PA; Raytheon Corporation, Waltham, MA; TRW, Inc., Redondo Beach, CA; Vought Corporation, Dallas, TX; McDonnell Douglas, St. Louis, MO, Long Beach, CA, Huntington Beach, CA; Lockheed Aircraft, Marietta, GA; and Northrop Corporation, Hawthorne, CA; The Boeing Company, Seattle, WA; and Rockwell International in Los Angeles, Seal Beach, and Canoga Park, CA; United Technologies, West Palm Beach, FL.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 69CW, Advanced Composites. This project develops and validates advanced organic matrix composite structural materials for Air Force weapons systems and aerospace applications. The lightweight, high stiffness and strength, and tailorability of the properties of advanced composites provide unique capabilities and high likelihood of being a key technology necessary for meeting many Air Force requirements including runway independence, greater range and payload capability, unique mission performance abilities such as low observables, lower fuel usage, and reduced cost of operation and maintenance. The project has two overall objectives: (1) engineering materials development, and (2) component validation. Over the next 10 years, the output of this project is expected to make composite structures less costly than metal items, while providing significantly increased design and performance options for aircraft, missiles, and satellites. The MX composite deployment module demonstration was completed in FY 1982, providing up to 30 percent weight savings and 10 percent cost savings, and transitioned to the MX system. The MX composite Stage IV completed structural validation in FY 1982. The composite satellite component structure replacement program completed structural, dynamic and operational performance testing in FY 1982 with 18 percent weight reduction and reduced vibration levels. Four of the components transitioned to the GPS satellite. The aircraft wing/fuselage durability program continued to validate improved fatigue life characteristics and the damage tolerance program was started in FY 1982. It will demonstrate the damage insensitivity of graphite/epoxy composite structures in FY 1983. Radar absorbing structures will be developed starting in FY 1983 with order of magnitude cross section reduction, reduced weight, and demonstrated durability and damage tolerance for operational aircraft application.

Program Element: #63211F Title: Aerospace Structures and Materials
DOD Mission Area: #553 - Engineering Technology (ATD) Budget Activity: #2 - Advanced Technology Development

B. Project: 486U, Advanced Metallic Structures. This project provides for the design, fabrication, test, and evaluation of aircraft primary and secondary structures using new metallic concepts such as metal-matrix composites, advanced powder metallurgy, and improved metal alloys. Reduced acquisition and maintenance costs, increased structural integrity, new mission capabilities, and more efficiently performing systems are the objectives. Major assemblies such as wing carry-through structures, fuselage sections, wing structures, and others are built and tested to demonstrate that advanced technology can satisfy these objectives. The project was initiated in 1971 to address structural problems existing with operational aircraft and has been continued to demonstrate that new technology can significantly improve the structural integrity, performance capability, and reduce overall costs of current and future Air Force systems. It is the primary program supporting the Department of Defense/Congressionally directed programs in metal-matrix technology. Fabrication of advanced, reinforced titanium fan blades began in FY 1982. These have lower weight (15-30%) and are projected to have higher tip speeds than state-of-the-art blades with no mid-span damping shroud. Results of future engine evaluation of these blades are expected to show both higher thrust-to-weight performane and a concurrent improvement in specific fuel consumption. Evaluation and engine testing began in FY 1982 for eutectic high pressure turbine blades that will have an operating temperature about 250°F greater than current blades for improved engine thrust and efficiency. Structural verification of advanced powder metallurgy aluminum alloys will begin in FY 1983. These materials offer the potential for a 20 to 30 percent improvment in strength and stiffness-to-weight ratios. Metal-matrix composite programs in aluminum, two sheet fiber/titanium matrix design development, and missile/ space structures payoff continued through FY 1982. Demonstration of full-scale metal-matrix aircraft wing and missile body structures also continued throughout FY 1982. For FY 1983, lower cost/ higher reliability operational aircraft components will complete detailed design and enter fabrication. Aluminum and titanium metal-matrix composite programs will continue in FY 1983 with aluminum metal-matrix missile and aircraft demonstration parts entering detailed design and fabrication. The powder aluminum demonstration program will complete design in FY 1983. An effort to provide integral visco-elastic damping of space system structures has been initiated in FY 1983. For FY 1984, the metalmatrix structures fabricated in FY 1983 will enter testing. Fabrication of powder aluminum parts will also begin in FY 1984.

C. Project: 2100, Laser Hardened Materials. This project develops materials and concepts that reduce the vulnerability of Air Force systems to laser damage. It addresses hardening of representative critical components and subsystems of all type systems, including aircraft, satellite, missiles, sensors, and personnel. In FY 1982, successful subscale and full scale hardened satellite electro-optical components were tested against continuous wave and pulsed lasers. Programs to harden PAVE TACK and LANTIRN against laser threats were initiated. The FY 1983 project will continue the satellite component effort to demonstrate higher hardening levels and extend the technology to include multiple wavelength and pulsed lasers. A hardened forward looking infrared sensor component demonstration and a flight test evaluation of an AIM-9L with hardened sensor optics will be initiated. Personnel protection concepts will also be selected. Flight demonstration of space defense materials systems concepts will be accomplished. The FY 1984 program will continue satellite and missile hardening development and demonstrations, and initiate flight test of the laser hardened seeker technology demonstrator. The personnel eye protection program will include human engineering evaluations.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63215F — Title: Aviation Turbine Fuel Technology
DOD Mission Area: #553 - Engineering Technology (ATD) — Budget Activity: #2 - Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	6,486	8,699	5,042	7,092	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Hardware testing in this Program Element will validate aviation turbine fuel specifications for fuels derived from low quality petroleum crudes and non-petroleum sources such as shale oil, tar sands and coal. The program will concentrate on the hardware (aircraft and ground support equipment) implications of the transition to non-petroleum fuels. The program provides the Research, Development, Test and Evaluation (RDT&E) basis for the first operational use of shale fuel in the Air Force Operational Validation Program and is a part of the DOD program to utilize fuels incentivized by the Energy Security Act of 1980. This program supports the need to assure both availability of aviation fuel and a domestic source for such fuels.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

6,486	8,699	8,465		Continuing	N/A

FY 1984 estimate has been reduced by 3,027 resulting in decreased scope of test programs. Large scale advanced tactical fighter (ATF) engine gas generator testing using fuel derived from shale oil and broadened specification petroleum fuel has been deleted.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

Not Applicable.

Program Element: #63215F | Title: Aviation Turbine Fuel Technology
DOD Mission Area: #553 - Engineering Technology (ATD) | Budget Activity: #2 - Advanced Technology Development

5. (U) RELATED ACTIVITIES: This program supports the Air Force's Operational Validation Program (Program Element 71112F) which will use only shale derived jet fuel at two Air Force bases. It extends the work of Program Element 62203F, Aerospace Propulsion. This program and the companion exploratory development programs in PE 62203F are coordinated with National Aeronautics and Space Administration (NASA), Department of Energy (DOE), Army and Navy programs. NASA is conducting cooperative planning with the Aero Propulsion Laboratory to assure the military and civilian synthetic fuels efforts are complementary. The Army, Navy and Air Force synthetic fuels programs are coordinated through the Under Secretary of Defense for Research and Engineering. Test fuel planning in cooperation with the DOE is being coordinated through the Office of the Secretary of Defense. Test fuels acquisition, transportation and storage is being managed by the Defense Fuel Supply Center of the Defense Logistics Agency.

6. (U) WORK PERFORMED BY: The work is managed and performed by the Aero Propulsion Laboratory, Wright-Patterson Air Force Base, OH. The majority of the effort will be conducted under contracts to qualified bidders. Current contractors are: General Electric Engine Group, Evendale, OH; Pratt and Whitney Aircraft Group, Government Products Division, West Palm Beach, FL; Boeing Military Airplane Co., Seattle, WA; General Dynamics, Fort Worth Division, Fort Worth, TX; Solar, San Diego, CA; and AiResearch, Phoenix, AZ.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

(U) Project: (2480 - Aviation Turbine Fuel Technology)

A. (U) Project Description:

- This project will provide the basis to develop a new, flexible, cost effective aviation turbine fuel specification for fuels developed from lower quality petroleum (1986) and from other hydrocarbon feedstocks such as shale, tar sands, and coal (1990).

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments:

- Testing with six different petroleum test fuels was completed in Air Force inventory hardware (combustors, turbines, and afterburners). A freeze point relaxation study was contracted with first indications that specification changes in freeze point are possible. Testing of shale derived fuels in combustors and turbines was completed. These preliminary tests have shown that shale refined to current specifications poses no problems.

(2) (U) FY 1983 Program:

- Complete fuel system, engine and flight assurance testing of shale derived turbine fuel. Define procurement specification for operational shale derived fuel. Determine the effects of broadened specification fuels on A/C auxiliary power units. Complete fuel effects evaluation of advanced turbine engine hot section components. Initiate studies of jet fuel produced from tar sands.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request:

- Complete studies to define optimum specification requirements for fuel derived from low quality petroleum crudes. Continue studies of fuel produced from tar sands. Initiate turbine engine performance/durability assessment for broadened specification petroleum derived fuel. Cost estimates are based on historical data for component and engine testing.

(4) (U) Program to Completion:

- This project will continue to support the Air Force's Operational Validation Program. The project will result in a broadened specification for fuels developed from low quality petroleum crudes in 1986 and a more comprehensive specification including synthetic fuels by 1990. This is a continuing program.

C. (U) Major Milestones:

Not Applicable.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63216F
DOD Mission Area: #553, Engineering Technology (ATD)

Title: Advanced Turbine Engine Gas Generator (ATEGG)
Budget Activity: #2, Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	33,278	30,979	26,905	25,397	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF PROGRAM ELEMENT AND MISSION NEED: This program ensures that there is a continuous development and demonstration of the most advanced turbine engine high pressure core components. Advanced compressors, combustor and high pressure turbines are integrated into gas generators in which the durability, cost and performance aspects of these core engine technologies can be assessed. A building block approach is utilized to systematically assess both the independent component characteristics and the interactive, interdependent component characteristics under the most realistic operating environment. This critical integrated hardware demonstration enhances the early low risk transition of these technologies to engineering development. Advanced aircraft and/or growth aircraft systems are dramatically affected by propulsion related capability such as durability, reliability, life cycle cost and performance. These features are directly translated to thrust/weight; specific fuel consumption at cruise and in afterburner; stallfree operation; matched cycle performance within a mission envelope; ease of maintenance; lower acquisition cost; and increased reliability/durability. Proper attention to these propulsion features will ensure that advanced aircraft systems can achieve longer range, higher payload, increased maneuverability, increased sortie rate and improved operability.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	RDT&E	33,278	30,979	33,128		Continuing	Not Applicable

(U) FY 84 Program was reduced to support higher priority programs. Resulted in reduction in durability testing to allow durability testing early in the life cycle.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

5. (U) RELATED ACTIVITIES: Gas generator and other engine component feasibility and practicality is demonstrated initially in Exploratory Development under Program Element 62203F, Aerospace Propulsion. The other engine subsystems such as fans, controls and afterburners which, when added to the basic gas generator complete the engine, are demonstrated in advanced development under Program Element 63202F, Aircraft Propulsion Subsystems Integration (APSI). Close coordination will be continued with the Navy, Army and NASA to ensure that resources are effectively utilized for common needs. Current and planned development efforts by the Navy Advanced Propulsion Program (63210N), the APSI Program (63202F), Turbine Fuel Technology Program (63215F), Materials Laboratory (62102F, 78011F) and Flight Dynamics Laboratory (63211F) directly complement ATEGG effort.

Program Element: #63216F
DOD Mission Area: #553, Engineering Technology (ATD)

Title: Advanced Turbine Engine Gas Generator (ATEGG)
Budget Activity: #2, Advanced Technology Development

6. (U) WORK PERFORMED BY: The program is managed by the Aero Propulsion Laboratory, Wright-Patterson Air Force Base, OH. Five turbine engine contractors are currently involved in this effort: The Detroit Diesel Allison Division of General Motors, Indianapolis, IN; Teledyne CAE, Toledo, OH; General Electric, Evendale, OH; Pratt and Whitney, West Palm Beach, FL; and Garrett Turbine Engine Co., Phoenix, AZ.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: Advanced Turbine Engine Gas Generator (ATEGG)

A. (U) Project Description: This Advanced Development Program will ensure that turbine gas generator technology is available to meet the requirements of future aircraft propulsion systems. To ensure that these needs can be met requires a better definition of the engine's operating environment; advanced designs that maximize the trade-offs between performance and life characteristics within this environment; and effective test and measurement techniques to verify this capability. The gas generator is the basic building block of the engine and it consists of a compressor, a combustor, and a turbine to power the compressor. The objective of this program is to provide the continued evolution of the most advanced core engine technologies (compressors, combustors, and high pressure turbines) into an advanced gas generator in which the performance, cost and durability aspects can be assessed in a real engine environment. This critical hardware demonstration will enhance the early low risk transition of these technologies to engineering development where they can be applied to growth systems and/or new systems. The technologies are scalable, flexible, and applicable to a wide variety of potential systems applications. Flight size, flight weight gas generators are initially tested to define flow path characteristics. Once the flow path has been characterized and mechanical integrity verified, the gas generators are subjected to accelerated life testing to characterize the structural aspects of the advanced component designs. New component technologies are introduced on a step-by-step basis so that their individual performance/structural characteristics can be assessed and so that the relationship (effect) of the new component on other components and the integrated gas generator can be accurately assessed.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: During this time period, three new gas generator designs completed initial flow-path definition testing. A total of seven major gas generator builds/tests were accomplished. Large engine gas generator efforts focused on the assessment of high-through-flow (HTF) gas generators. Two large engine gas generator designs completed a maturation process which includes comprehensive flowpath documentation and durability/life testing. Specific efforts included: (a) turbine vane environmental characterization testing, accelerated mission-type durability testing, and fabrication and test of a HTF gas generator at one contractor; (b) initial test of a new HTF gas generator and structural testing of an advanced combustor (four lifetimes when compared to current operational combustor) at a second contractor; and (c) turbine environmental characterization testing including up to 800 durability cycles, and HTF compressor fabrication at a third contractor. All large engine contractors fabricated additional hardware needed for extended structural tests of gas generators and initiated installation of additional structural instrumentation. Small engine gas generator efforts were aimed at the initial flowpath testing on a new gas generator with a three-stage compressor, vaporizer plate combustor, and high rim speed turbine. This new gas generator represents a 25 percent

reduction in stages/parts and a three-fold increase in life compared to current small engine gas generators. An environmental characterization test was conducted on a small gas generator to determine the effects of variable cooling on the high pressure turbine. During this time period, additional hardware fabrication was completed to support high risk structural/durability testing.

(2) (U) FY 1983 Program: During this period a major program milestone will be accomplished; Three ATEGG contractors will achieve a dual gas generator test effort, utilizing one core engine to assess the most advanced new components under the ATEGG Task I Flowpath effort and a second more mature test vehicle to assess the durability of advanced concepts under the ATEGG Task II structure effort. Three contractors will be conducting accelerated life testing on gas generators. Specific large engine efforts will include: (a) turbine vane/combustor accelerated life testing including up to 3,000 thermal cycles, and the initial test of a high through-flow gas generator at one contractor; and (b) accelerated life testing of an advanced dual-wall combustor (4 x life improvement) and a monocrystal turbine, and performance/structural testing of a five-stage high-through-flow compressor gas generator at a second contractor. Small engine gas generator efforts will include; (a) turbine vane/combustor environmental characterization and life testing, and component design/integration of an improved three-stage axial-centrifugal compressor at one contractor and (b) fabrication/assembly of an advanced two-stage gas generator utilizing a single-stage centrifugal compressor at a second contractor.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Three ATEGG contractors will be conducting extensive accelerated life tests. This structural testing will provide increased confidence and reduce the risks of transitioning advanced technology options which offer a 3 - 4 times improvement in life, 7-10 percent reduced fuel consumption and 20 - 30 percent lower life cycle cost. Specific large engine efforts include: (a) transient environmental characterization and accelerated life/durability testing of a lightweight shingle liner combustor and a high efficiency monocrystal turbine over various potential usage conditions, and an assessment at maximum temperature of a high-through-flow gas generator at one contractor; and (b) rammed-cyclic accelerated life testing of a dual-wall combustor and rapid solidification rate/radial wafer turbine at a second contractor to assess the effect of acceleration times on component life, and stall-hysteresis assessment of an improved five-stage high-through-flow compressor. Small engine gas generator efforts will include: (a) extensive life testing of an advanced thermal barrier coated turbine vane/combustor configuration and structural diagnostic testing of a new three-stage axial-centrifugal compressor at one contractor; and (b) initial flowpath/performance testing of an advanced two-stage gas generator utilizing a single-stage centrifugal compressor at a second contractor.

(U) Competitive gas generator options will continue to be pursued to maintain a minimum four contractor competitive technology baseline. Emphasis will be placed on continued enhancement of durability oriented testing of hardware designs with special attention to accelerated life testing. Gas generator component designs/redesigns and testing will focus on those efforts prerequisite to the definition and full scale development of the next generation fighter engine in the mid to late 1980s time period. The focus will be on conducting those environmental characterization tests and accelerated life tests required to verify the structural design system of the advanced components. This testing will make possible an accurate correlation between the predicted and actual design life of engine hardware.

Program Element: #63216F
DOD Mission Area: #553, Engineering Technology (ATD)

Title: Advanced Turbine Engine Gas Generator (ATEGG)
Budget Activity: #2, Advanced Technology Development

During this period, four builds/tests will be conducted on large engine gas generators and two builds/tests will be conducted on small engine gas generators. The cost estimates for this program are based upon a level of effort test program in accordance with the ATEGG Five Year Plan and the ATEGG Program Management Directive.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63226F
DoD Mission Area: #551 - Electronic and Physical Sciences (ATD)

Title: DOD Common Programming Language (Ada)
Budget Activity: #2-Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	6,974	6,930	7,801	8,075	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program is part of the total DOD effort to implement, introduce, and provide life-cycle support for Ada, the DOD common, high-order programming language for embedded computers. It will provide resources to meet those language support requirements which are common to the services and agencies. It will provide for configuration control of the Ada language, enforcement of standardization via compiler validation, educational promotion, development of an Ada Programming Support Environment (APSE), and accelerated development of Ada responsive life-cycle software development tools/methodologies.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in Thousands)

6,974	6,930	5,748	-	Continuing	Not Applicable

- Additional RDT&E funding in FY 84 and FY 85 provide for accelerated development of Ada responsive life-cycle software development tools/methodologies and is intended to be responsive to Congressional direction (conference report on DOD authorization act 1983) to "accelerate implementation of the Ada high order language."

4. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

- None

5. (U) RELATED ACTIVITIES: The Ada Program is managed by the DOD Ada Joint Program Office (AJPO) through coordination with the components. In general, the AJPO is responsible for the common Ada-related needs of the DOD, and the components are responsible for component specific needs. For example, rehosting/retargeting of Ada Programming Support Environment software to a component specific architecture is the responsibility of the components. Each component has developed an introduction strategy and is responsible for implementation of that strategy. Related program elements supporting component specific Ada needs are: PE64740F Computer Resources Management Technology, PE63728F Advanced Computer Technology, PE63723A Command and Control, PE62746A Tactical ADP Tech, PE63526N Advanced Computer technology and PE63253F PAVE PILLAR. In addition to the above, work performed under PE63226F is the basis for some efforts planned under DOD's new software initiative, PE63756A Advanced Sotware Technology. PE63756A will be a new start in FY84.

Program Element: #63226F
DoD Mission Area: Electronic and Physical Sciences (ATD), #551

Title: DOD Common Programming Language (Ada)
Budget Activity: Advanced Technology Development, #2

6. (U) WORK PERFORMED BY: The Ada Joint Program Office is responsible for all work performed under this program element. Specific efforts will be conducted by Air Force, Army and Navy organizations as appropriate. Major contractors are Honeywell, Mineapolis, Min; Softech, Boston, MA; Intermetrics, Boston, MA; Computer Science Corp, Falls Church, VA; Texas Instruments, Dallas, TX.

7. (U) DOD COMMON PROGRAMMING LANGUAGE (ADA) (SINGLE PROJECT LESS THAN $10 MILLION IN FY84)

A. Project Description: DOD computer software life-cycle costs are measured in the billions of dollars. Inflation and increased applications of computers to new functions threaten to make software an even more substantial portion of the DOD budget. The DOD recognizes that use of a common, high order language and a modern programming support environment coupled with modern programming practice will provide leverage to control the cost and improve the reliability of software. In 1975 the Director, Defense Research and Engineering (DDR&E), established the High Order Language Working Group (HOLWG), with representation from Army, Navy, Air Force, Defense Communications Agency (DCA), National Security Agency (NSA), and Defense Advanced Research Projects Agency (DARPA), to investigate the feasibility of adopting a common, high order computer language for use in embedded computer systems. By July 1980 the HOLWG had successfully published a formal definition of the new standard DOD computer programming language, Ada. On December 12, 1980, the Under Secretary of Defense for Research and Engineering established the Ada Joint Program Office, (AJPO), attached to the Office of the Deputy Under Secretary of Defense (Acquisition Policy). The AJPO Charter assigns to the AJPO the management responsibility formerly provided by the HOLWG and DARPA. For the future, there are three major tasks in the Ada Program to be accomplished: the AJPO must ensure the implemention and maintenance of Ada as a consistent unambiguous standard recognized by the DOD and also by the widest possible community; the AJPO must ensure the smooth introduction and acceptance of Ada in the DOD as early as possible consistent with the needs of individuals components; and the AJPO must ensure the provision of life-cycle support for Ada through the development of a robust Ada Programming Support Environment (APSE) to improve productivity both in development and in continued evolution. Ada is an important step forward for US Department of Defense software technology. The major programming language innovations of the last ten years have been consolidated and unified in a language which meets the needs of nearly all DOD applications. By transitioning to a single modern high order language in Defense systems, DOD will derive significant benefits in the areas of training, compiler and programming tool availability, software maintainability and reduction of other software development costs. PE63226F funds the service and agency common remaining tasks in the Ada program needed to successfully complete this transitioning.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Completion of the final version of the Ada language reference manual specification for submission to the American National Standards Institute (ANSI). NATO Ad Hoc working group established to adopt Ada as a NATO standard. Policy and procedures establised for the Ada Compiler Validation Office (ACVO). Memorandum of Understanding signed between the Army, Air Force, Navy and DoD to pursue tool transportability between Ada programming support environments (APSE). Development completed of a test Ada compiler. Upgrade of an Ada test translator initiated. Military/industrial/academic interface teams established to develop standards and conventions that will enable portability of tools between Ada programming support environments (APSE). A DOD-National Bureau of Standards joint effort to refine current programming tool taxonimies for Ada use was initiated.

Program Element: #63226F
DOD Mission Area: Electronic and Physical Sciences (ATD), #551

Title: DOD Common Programming Language (Ada)
Budget Activity: Advanced Technology Development, #2

(2) (U) FY 1983 Program: Formal American National Standards Institute (ANSI) Standardization will be achieved and an Ada Language Control Board established. Validation of Ada compilers will be underway. Development of an Ada video tape course will be initiated. An Ada Information Center will be established. The initial Army APSE, called the Ada Language System, will undergo checkout/shakedown testing by military services and industry. A life-cycle Ada methodology document will undergo public review.

(3) (U) FY 1984 Planned Program and Basis for FY 1984

RDT&E Request: Development will be undertaken of a formal semantic definition of the Ada language to insure an unmistakeably clear description of the standard. Compiler validation capabilities will be expanded, and improved satellite Ada compiler Validation Facilities will be established. The Ada video tape course will be completed and Ada military training initiated. The initial Army APSE will complete checkout/shakedown testing and become available for widespread use. Development of tools to support a life-cycle methodology for Ada software design, coding, test and maintenance will be undertaken.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63227F   Title: Advanced Simulator Technology
DOD Mission Area: #552 - Environmental and Life Sciences (ATD)   Budget Activity: #2 - Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	4,192	10,739	6,731	6,402	Continuing	N/A
2363	Advanced Visual Technology System	4,192	10,400	6,635	4,960	3,305	38,255
2743	Advanced Simulator Concepts		339	96	1,442	30,200	32,077

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Air Force must train and maintain a skilled force of combat-ready pilots. Improved simulator training technology is essential in order to meet this requirement. Currently, air-to-air, air-to-ground, and terrain-following simulator training is limited by the lack of visual scene detail and complexity, and display brightness and resolution. This program element supports work in the Training and Personnel Category of TRAINING DEVICES and SIMULATION. It develops subsystems to improve the performance capabilities of flight simulators, with special emphasis on developing and demonstrating improved visual image generation and projection techniques to provide more adequate visual displays for combat mission training. In the visual display area, significant improvements in display resolution, brightness, and the number of responsive moving targets will be possible. Advanced image generation techniques will be developed to provide more complex and realistic combat scenes for training. This program will also demonstrate the feasibility of using helmet mounted display technology as a low cost transportable alternative to the large pancake window or dome displays currently used for providing wide field of view visual scenes.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	RDT&E	2,192	10,739	6,941		Continuing	N/A

FY 1982 actual funding was increased by reprogramming $2 million into PE 63227F in order to keep critical engineering developments on schedule.

4. (U) OTHER APPROPRIATION FUNDS: Not applicable.

Program Element: #63227F Title: Advanced Simulator Technology
DOD Mission Area: #552 - Environmental and Life Sciences (ATD) Budget Activity: #2 - Advanced Technology Development

5. (U) RELATED ACTIVITIES: Related program elements: 61102F, Defense Research Sciences; 62205F, Training and Simulation Technology; 62202F, Aerospace Biotechnology; and 63751F, Innovations in Education and Training; 64227F, Flight Simulator Development; 63738A, Non-Systems Device Development; 63216A, Synthetic Flight Simulators; 62757N, Human Factors and Simulation Technology; 63733N, Training Device Technology; and 63720N, Education and Training. There is a continuing interface and close coordination among the Army, Navy, and Air Force on simulation for training purposes. The Air Force Human Resources Laboratory as the Air Force Systems Command laboratory focal point for training simulation technology, closely monitors all significant research and development being conducted by other Department of Defense, National Aeronautics and Space Administration, and industrial organizations to eliminate redundancy. A major interservice cooperative effort involves a jointly funded effort with the Army Program Manager for Training Devices to develop improved silicon light-valve projector technology. Close coordination within the Air Force user community is also ensured by semiannual research and development coordinating meetings between AFHRL, the Aeronautical Systems Division and the Major Commands (TAC, SAC, MAC, ATC).

6. (U) WORK PERFORMED BY: The program is performed by the Air Force Human Resources Laboratory through the Operations and Training Division, Williams Air Force Base AZ. Major contractors are: General Electric Company, Daytona Beach FL (Project 2363); Sodern, Limeil-Brevannes, France (Project 2363); Canadian Commercial Corp, Ottawa, Canada (Project 2743).

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 2363, Advanced Visual Technology System This project provides for the development and installation of an advanced computer image generation system on the Advanced Simulator for Pilot Training (ASPT). The Advanced Visual Technology System (AVTS) represents a two-pronged approach to advancing the state-of-the-art in visual simulation technology and demonstrating the utility of this technology for critical Tactical Air Force (TAF) training requirements. One effort will develop an advanced 10-channel computer image generation (CIG) system that will meet the TAF training requirements for scene detail and complexity. Another effort will develop an advanced prototype light valve capable of meeting the TAF training requirements for visual display resolution, fine detailed target images (miniraster inserts), scene brightness, and contrast. The combination of the advanced CIG and light valve displays will produce a research simulator which will be adequate to demonstrate and define the TAF simulator training requirements. The visual system design training effectiveness issues which will be evaluated with the new CIG and projectors are: edge and circle feature density and utilization, surface texturing, point feature density, object spacing and utilization, general data base complexity and requirements, maximum range for cue generation, shadows and brightness gradients, planar versus non-planar terrain, edge smoothing, area(s) of interest implementation (for fine detail), visual field-of-view, color, contrast, display persistence, display resolution, geometric distortion, inter-channel mismatch, and disparities between visual displays and other cockpit displays (sensor, radar, etc.). In FY 1982 the system design for the new CIG was completed and development of the solid crystal light valve projector continued with subcomponent improvements in brightness, resolution and target size. Progress was also made in growing larger crystals and improving other components which affect image resolution. In FY 1983 the general purpose computer hardware and peripheral equipment needed for the advanced CIG will be procured and fabrication will begin on the special purpose image generation computers. In FY 1984 the development and fabrication of the advanced CIG will be

Program Element: #63227F Title: Advanced Simulator Technology
DOD Mission Area: #552 - Environmental and Life Sciences (ATD) Budget Activity: #2- Advanced Technology Development

A. Project: 2363, Advanced Visual Technology System. (Cont.)
completed. Many of the CIG and some of the display hardware parameters can be investigated with current prototype state-of-the-art light valve displays. The AVTS CIG will be installed on the ASPT in late FY 84 with interim light valve displays in order to obtain answers to many of the research issues listed above as soon as possible. The advanced prototype light valve will be completed and prototype units will be installed on the ASPT in FY 1986 and FY 1987 for evaluation.

B. Project: 2743, Advanced Simulator Concepts. This project will develop a Combat Mission Trainer (CMT) that should provide effective transportable air combat training at minimum cost. This will be accomplished through the use of a helmet-mounted display employing fiber optic bundles to transmit the visual scene from image generators and associated light valve displays to helmet-mounted optics. The entire CMT, consisting of the visual system, cockpit, and instructor/operator station, will be modular in construction and transportable. The lower cost and transportability will make it possible to use aircraft simulators at the squadron level providing an optimum density of training availability. In FY 1982, an initial prototype breadboard fiber optic helmet-mounted display was developed under PE 62205F, Training and Simulation Technology. This prototype was delivered in the first quarter of FY 1983. Advanced development of the CMT will start in FY 1983 with the construction of a laboratory prototype. The laboratory prototype will be fabricated from many used components and it will provide a simulation capability including the cockpit, instructor-operator station, head tracking capability, and computational equipment needed to evaluate the training effectivenss of the CMT concept. In FY 1984 the development of the CMT laboratory prototype will continue with emphasis on training effectiveness evaluations of the laboratory prototype, especially the helmet-mounted visual display. In FY 1985 and beyond, the helmet-mounted visual display will be improved with lighter weight helmet optics and fiber optic bundles, after the field-of-view, high resolution areas and other training effectiveness requirements have been defined in FY 1984. In the future, a prototype transportable CMT will be developed.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63231F
Title: Crew Systems Technology
DOD Mission Area: #552 Environmental and Life Sciences (ATD)
Budget Activity: #2 - Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0	2,000	7,862	12,482	Continuing	N/A
2829	Cockpit Automation Technology	0	0	1,491	5,204		
2830	Advanced Life Support Systems	0	2,000	3,845	2,643		
2868	Crew Escape Systems Technology	0	0	2,526	4,635		

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Weapon system development has reached the point where the operator may become the limiting factor in total system performance. The performance envelope of the weapons system exceeds man's capability to perform in that environment. Information available for the system operator concerning the status of the weapons system is so complex and fluid that it can exceed his ability to perceive, decide, and act upon the information. Modern tactics and mission scenarios continually place the operator in environments from which there is low probability of successfully escaping in an emergency. Mental and physical demands can place the operator in situations from which he cannot recover. This program element has been established to provide advanced development and demonstration of concepts to protect the crewman in the hazardous aerospace environment. It will demonstrate the capability to safely egress aircraft at the extremes of the performance envelope and develop the methodology to maximize decision making by the system operator/manager.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

0	4,055	3,905

The efforts in Projects 2829, Cockpit Automation Technology (CAT) and 2868, Crew Escape Systems Technology (CREST), are transitioning from exploratory development into advanced development in FY 1984 as new projects. These projects will capitalize on previous developments and will continue through FY 1989. Reduction of $2 million in FY 1983 results in five month slip of ALSS contract initiation and one year delay in its dual port regulator preliminary design. Reduction in FY 1984 delays workload performance measures from CAT by one year and reduces scope of CREST preliminary design effort.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands) None.

Program Element: #63231F Title: Crew Systems Technology
DOD Mission Area: #552 Environmental and Life Sciences (ATD) Budget Activity: #2 - Advanced Technology Development

5. (U) RELATED ACTIVITIES: These projects interact with materials and electronics technology development conducted in other laboratories. Formal agreements exist and joint participation in steering groups assure development phasing and goals are compatible. Technology will transition to the Aeronautical Systems Division, principally the Life Support Program Office, for full-scale engineering development. Transition plans have been fully reviewed by Aeronautical Systems Division and included in the Ten Year Life Support Master Development Plan. In addition, life support activities of the three military Services are coordinated through the Triservice RDT&E Steering Group reporting to the Joint Logistics Commanders. Laser protection technology is coordinated additionally through the Triservice Laser Hardened Materials and Structures Group, chaired by OUSDR&E.

6. (U) WORK PERFORMED BY: This program will be performed by the Aerospace Medical Division through its two laboratories, the Air Force Aerospace Medical Research Laboratory, Wright-Patterson AFB OH, and the USAF School of Aerospace Medicine, Brooks AFB TX; and, through Memoranda of Agreement with other laboratories, divisions and commands. This program will be primarily contractual, but does not yet have a contract history.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 2829 Cockpit Automation Technology. The objective of this project is to resolve the operator/manager task overload problem in the cockpit of modern sophisticated tactical aircraft. Currently, there is no criterion developed through a systems approach which allocates functions between the crew member and automated systems based upon quantitative terms of performance and cost. This project will provide the multidisciplinary process for analysis of alternative strategies in automation. Concepts of information presentation will be transitioned to this advanced development project for demonstration. This project will start in FY 1984; engineering analysis of tactical missions will result in characterization by a network of critical functions and requirements. Metrics for rating cockpit designs based on mission effectiveness will be identified. Technologies demonstrated in this project complement weapon system equipment automation efforts and enable effective human interface with these systems. Ultimately, this project will provide procedures for evaluating future cockpit design in quantitative terms of effectiveness and survivability through full mission simulations.

B. Project: 2830 Advanced Life Support Systems (ALSS). The objective of the ALSS project is to provide integrated protection for crewman in the hazardous aerospace environment to the extremes of the performance envelope of modern aircraft. Protection concepts explored in the laboratories will be transitioned in FY 1983 as an integrated synergistic system of protection with reduced encumberance to the crewman. The concepts to be demonstrated will provide protection against altitudes to 60,000 feet, acceleration forces to nine times the force of gravity, cockpit temperatures to $122^{o}F$ ($50^{o}C$), and protection of the crewman's vision from known laser and nuclear threats. Current equipment and procedures protect to altitudes of 50,000 feet and from forces approximately six to seven times gravity. Phase I, Preliminary

Program Element: #63231F Title: Crew Systems Technology
DOD Mission Area: #552 Environmental and Life Sciences (ATD) Budget Activity: #2 - Advanced Technology Development

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: (Continued)

B. Project: 2830 Advanced Life Support Systems (ALSS). (Continued)

Design, was initiated in FY 1983 to permit engineering analysis of design alternatives for the integrated ensemble. Concept alternatives include: liquid body cooling, positive pressure breathing, chest counterpressure, proportional lower extremity counterpressure, on-board breathing gas generation, and head protection. These individual technologies have been developed elsewhere but require integration into a nonencumbering ensemble. In FY 1984 detailed design of the integrated ensemble will start based upon the FY 1983 analysis. Preliminary design will start on a dual port regulator for the positive pressure oxygen delivery system. Procedures for ground based test and evaluation will be complete and preliminary engineering analysis of concepts for vision protection from laser weapons will start.

C. Project: 2868 Crew Escape Technology (CREST). The objective of the CREST project is to demonstrate technology which will expand the safe ejection envelope to the extremes routinely encountered in modern tactical mission scenarios. New capabilities in combat maneuvering, low altitude penetration, high speed envelope, and multiple crew ejection were not addressed in current operational seats. Concepts of passive windblast protection under high dynamic pressure (1600 Q), limb restraint, stabilization, and continuous adaptive control will transition in FY 1984 for demonstration in this new start project. Phase I, preliminary design, will be conducted by competitive contracts in FY 1984. Trade studies will be accomplished, subsystem specification will be developed, seat structural frame for integrated subsystem testing will be designed and full developmental costs will be estimated. Technical reports will document the above design and analyses. This project compliments current advanced development projects in aircraft maneuvering agility and thrust vectoring. Successful completion of this project will provide the means by which to reverse the unfavorable trend in escape injuries and fatalities.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63245F
DOD Mission Area: #553 - Engineering Technology (ATD)

Title: Advanced Fighter Technology Integration (AFTI)
Budget Activity: #2 - Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	13,955	10,967	19,492	28,588	Continuing	N/A
2061	Fighter Attack Technology (AFTI/F-16)	6,000	5,657	4,200	2,300		
2568	Mission Adaptive Wing (AFTI/F-111)	7,955	5,210	2,699	1,000		
2682	STOL Fighter Technology		100	7,393	17,288		
2979	Reliability and Maintainability for Fighter Technology Integration			5,200	8,000		

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program will develop and demonstrate in flight, separately and in combination, advanced aeronautical technologies that can substantially enhance the reliability, maintainability, combat potential and improve the survivability of our future military fighter/attack aircraft. The Digital Flight Control System (DFCS) and Automated Maneuvering Attack System (AMAS) technologies developed under PE 63205F, Flight Vehicle Technology, will be integrated and flight demonstrated on the F-16 testbed under project 2061 of this program element. Testing several technologies on the same test vehicle reduces costs and facilitates the integration of these technologies. Project 2568 will develop and demonstrate in flight the smooth skin variable camber Mission Adaptive Wing (MAW) concept on an F-111 test vehicle. Project 2682 will develop Short Takeoff and Landing (STOL) technologies to address the need for future fighter aircraft to operate from damaged runways. The selection of candidate technologies for integration is carefully weighed in each case to provide mission relevance and maximum benefit for the testbed demonstration aircraft. A separate project will follow and coordinate the system improvement in reliability and maintainability.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

11,855	10,967	14,570		Continuing	N/A

A. Project 2568, Mission Adaptive Wing; funding profile adjustment - 2,500K was reprogrammed in FY 1982 to accelerate installation of automatic camber control system as a cost avoidance measure in the out years. Project 2979, Reliability and Maintainability for Fighter Technology Integration; 5,200K was added to support DOD sponsored initiative for Electronic Reliability and Maintainability.

Program Element: #63245F
DOD Mission Area: #553 - Engineering Technology (ATD)

Title: Advanced Fighter Technology Integration (AFTI)
Budget Activity: #2 - Advanced Technology Development

4. (U) OTHER APPROPRIATION FUNDS: Not applicable.

5. (U) RELATED ACTIVITIES: This program is using the Advanced Fighter Technology Integration (AFTI) F-16 test vehicle to test the Digital Flight Control System and Automated Maneuvering Attack System technologies developed under PE 63205F, Flight Vehicle Technology. This program will also flight validate the integrated flight/propulsion control system and pilot/vehicle interface for Short Takeoff and Landing (STOL) mode operation being developed under PE 63205F. The AFTI program develops and validates technology items on a demonstrator aircraft which will then be available for incorporation in the design of the Advanced Tactical Fighter (PE 63230F). The AFTI program is a joint program with the National Aeronautics and Space Administration and is managed under an approved Memorandum of Understanding. The Digital Flight Control System development in project 2061 is jointly funded by the Air Force and Navy.

6. (U) WORK PERFORMED BY: This program is managed by the Air Force Flight Dynamics Laboratory, Wright-Patterson Air Force Base, OH. Contractors are General Dynamics Corporation, Ft. Worth, TX for project 2061; and The Boeing Company, Seattle, WA for project 2568. Flight testing for both projects will be performed jointly by Dryden Flight Research Facility and the Air Force Flight Test Center at Edwards Air Force Base, CA. Project 2682 contract will be awarded in September 1983.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 2061, Fighter Attack Technology (AFTI/F-16). This project develops and demonstrates in flight new aeronautical technologies offering improvements in combat effectiveness and survivability over current fighter aircraft. The program demonstrates these technologies, both separately and in combination, on the Advanced Fighter Technology Integration F-16 test vehicle. Technologies to be demonstrated include direct side force control, direct lift control and weapon line pointing using a Digital Flight Control System integrated with a forward canard. This system gives the aircraft independent six degree-of-freedom control capability for increased maneuverability. The Digital Flight Control System also allows selection of task-tailored flight control laws providing optimized aircraft performance for air-to-air combat, bombing, and evasive maneuver. Other technologies to be integrated and flight tested on the same aircraft include advanced pilot displays and the Automated Maneuvering Attack System (AMAS) linking the fire control system to the flight control system of the aircraft. AMAS will enable the aircraft to strike a target without direct overflight and will increase the firing opportunity envelope in air-to-air combat. AMAS will show a large improvement in survivability against all threats while maintaining conventional delivery accuracies. Project 2061 began the flight validation of the Digital Flight Control System on the F-16 test vehicle in FY 1982. The first flight took place on 10 July 1982 at Carswell Air Force Base, TX. The AFTI/F-16 was then flown to Edwards Air Force Base, CA to complete flight validation. Began software development and fabrication of the Automated Maneuvering Attack System (AMAS). The Preliminary Design Review for the AMAS system was held in Dec 81. Begin flight validation of the AMAS technologies on the F-16 test vehicle in late FY 1983. Complete flight validation of the Digital Flight Control System on the F-16 vehicle in mid-FY 1983. Continue flight validation of the Automated Maneuvering Attack System and evaluation at the Nellis test range throughout FY 1984.

Program Element: #63245F | Title: Advanced Fighter Technology Integration (AFTI)
DOD Mission Area: #553 - Engineering Technology (ATD) | Budget Activity: #2 - Advanced Technology Development

B. Project: 2568, Mission Adaptive Wing (AFTI/F-111). This project will develop a smooth skin variable camber wing system and flight test the system on an F-111 test aircraft. The wing box on the transonic aircraft technology F-111 test vehicle will be fitted with the variable camber leading and trailing edge wing system. The wing camber may be tailored in flight to achieve peak aerodynamic efficiency for a variety of missions. The development will increase aircraft range and maneuverability and is applicable to fighters, fighter bombers, strategic bombers and airlift aircraft. Initial flight testing will evaluate characteristics of a manual variable camber control system. An automatic flight control system to vary camber as a function of flight condition is being developed and will be evaluated after the manual system trials. In project 2568 design of the Automatic Flight Control System for the Mission Adaptive Wing continued through FY 1982. Fabrication of the manually controlled wing will be complete in FY 1983 leading to first flight in late FY 1983. This flight test has been delayed twelve months from the date presented in the FY 1982 RDT&E Descriptive Summary due to (1) an under estimate of the time required for safety of flight reviews prior to first flight, (2) earlier incorporation of the Automatic Flight Control System hardware for the second phase of flight testing, and (3) late delivery of the wings to NASA/Dryden Flight Research Facility. Flight validation of the manually controlled Mission Adaptive Wing begins in early FY 1984. Flight test of the automatically controlled system will begin in late FY 1984 and will demonstrate the full potential of the Mission Adaptive Wing for providing increased range/fuel economy, expanded flight envelope, enhanced maneuverability (tighter turns and direct lift capability), and gust alleviation.

C. Project: 2682, STOL Fighter Technology. This project will develop and validate technologies to provide supersonic fighters a Short Takeoff and Landing (STOL) capability without sacrificing today's performance capability. Specific technologies to be addressed are: two dimensional thrust vectoring/reversing nozzle, integrated flight/propulsion coupling; advanced high lift system, rough/soft field landing gear,and cockpit displays and controllers for night/weather STOL operations. The successful development of this STOL capability will be one solution to the runway interdiction problems facing our forces in Europe, as well as from less developed sites throughout the world. Project 2682 initiated program planning documents in FY 1982 including Sources Sought Synopsis, Business Strategy Panel, Source Selection Authority, Acquisition Plan, Contract Strategy Paper and Draft RFP. Reviewed industry comments on the Draft RFP. Release final RFP in late January 1983 and conduct source selection and award contract by September 1983. Initiate and complete Preliminary Design Phase of the contracted effort in FY 1984.

D. Project: 2979, Reliability and Maintainability for Fighter Technology Integrated Systems. Integrates, ground tests, and flight demonstrates enhanced reliability and maintainability concepts for advanced digital flight control system application. By taking advantage of on-board computational power, significant improvement of the AFTI/F-16 integrity management system can be developed that handles a broader range of system failures. Integrates fault tolerance and automated diagnostic functions providing enhanced fault detection and isolation. Maturing these fault tolerant and automated diagnostics techniques will allow dynamic reconfiguration of system resources, increasing the time between failures that impact the total system performance of the AFTI digital flight control system and the STOL engine controller. The project will then test the system in a ground based, real-time evaluation environment. Simulated malfunctions will be induced, testing the system's ability to identify, isolate faults, and take appropriate corrective actions. This effort's output will be the flight test baseline system. Flight testing will demonstrate the enhanced reliability and fault tolerance features for transition to operational use. This effort's output will be a validated set of design guides and criteria for future aircraft. There was no activity during FY 1982-1983 in this project, however other efforts in this program element and Program Element 63205F will be preparing for FY 1984 flight test of previously developed concepts. The FY 1984 planned program will begin integration and flight test of already mature concepts. Ground testing of new concepts for the next phase of flight tests will begin.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DECSCRIPTIVE SUMMARY

Program Element: #63250F
DOD Mission Area: #551-Electronic & Physical Sciences (ATD)

Title: Lincoln Laboratory
Budget Activity: #2-Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	22,117	23,079	25,070	23,755	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Lincoln Laboratory Program is a high technology research and development effort conducted through the provisions of a cost reimbursement contract with Massachusetts Institute of Technology. Lincoln Laboratory is operated as a Federal Contract Research Center with manpower control administered by the Department of Defense. The fundamental objective is to maintain a stable technology base in advanced electronics from which military systems may be developed. Utilizing this advanced electronics base, Lincoln actively engages in advanced research, primarily in the area of satellite communications, tactical technology, space surveillance, and radar techniques. Lincoln also provides technical advice and consultation to the military services and defense agencies.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	22,117	23,079	25,898	N/A	Continuing	N/A
Procurement	Not Applicable					

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable

5. (U) RELATED ACTIVITIES: Additional efforts are planned to be funded by the following respective program elements. Re-Entry Systems, 63311F; Military Satellite Communications, 33601F and 63431F; Ground Electro-Optical Deep Space Surveillance, 63428F and 12424F; Space Object Identification, 31310F, 31022F, and 31015F; Strike and Weapons Guidance, 62702F and 63601F; C^3 Countermeasures, 62702F and 63601F; IFF, 63742F; Airborne Countermeasures, 64738F; Speech Technology, 33401F, 27417F, and 28010F; Multi dimensional Signal Precessing, 62702F.

6. (U) WORK PERFORMED BY: Lincoln Laboratory, Lexington, MA, is operated as a special laboratory of the Massachusetts Institute of Technology under contract with the Air Force and is designated a Federal Contract Research Center. General policy and program guidance is provided by the Joint Advisory Committee in accordance with the provisions of the Department of Defense Plan for Administration of Lincoln Laboratory, dated 27 May 1975.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

Program Element: #63250F | Title: Lincoln Laboratory
DOD Mission Area: #551-Electronic & Physical Sciences (ATD) | Budget Activity: #?-Advanced Technology Development

8. (U) PROJECTS OVER $10 MILLION IN FY 1984 (Single Project - Lincoln Laboratory):

A. (U) Project Description: Lincoln Laboratory was established in 1951 by the Air Force with participation by other agencies of the Department of Defense. The primary mission is to conduct research and development pertinent to national defense, with particular emphasis on advanced electronics. The Lincoln program extends from fundamental investigations in science through the development of electronic devices and components to the design, development, and field demonstration of conceptual models containing the new technology. Lincoln actively engages in advanced research primarily in the areas of satellite communications, tactical technology, space object surveillance and identification, and radar techniques. Lincoln also provides technical advice and consultation to the military service defense agencies.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: During FY82, line funding was to complete the EHF MILSATCOM laboratory development system. This demonstrates in a working system the viability of the signal-processing technology required by MILSTAR to realize AJ service to strategic and tactical forces. The Laboratory-developed Permeable Base Transistor demonstrated operation above 100 GHz, thus permitting its future application as a long-life, solid state, R-F power amplifier in the MILSTAR system. Single crystal Silicon-On-Insulation (SOI) CMOS transistors were demonstrated for radiation-hard, low-power, digital satellite circuits. A ground-based, imaging-infrared, moving-target tactical radar was demonstrated for nightime and poor weather operation.

(2) (U) FY 1983 Program: During FY83, the previously demonstrated EHF MILSATCOM technology is being actively transferred to contractors to reduce risk and cost in the acquisition of the MILSTAR system. System Engineering support to the MILSTAR JPO is using the available EHF technology to structure a realizable system that is responsive to user needs. EHF technology development continues. Improvements in EHF Permeable Base and silicon-on-insulator radiation-hard transistor fabrication are under way. An airborne version of the tactical imaging radar is being developed.

(3) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Continued support of technology transfer to the MILSTAR JPO will intensify as the system enters Engineering Development. [

] A

laboratory demonstration system will show the operation of a heterodyne laser communication system for high data-rate satellite cross links. Permeable Base EHF Transistor amplifiers and silicon-on-insulator integrated digital circuits will be developed. Initial flight tests of the imaging infrared radar will be undertaken.

(4) (U) Program to Completion: This is a continuing program.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63253F Title: Advance System Integration Demonstrations (PAVE PILLAR)
DoD Mission Area: #551, Electronics and Physical Sciences Budget Activity: #2, Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	5,374	16,421	29,023	33,744	Continuing	Not Applicable
2734	Advanced System Avionics (ASA)	3,880	10,288	11,800	10,000	Continuing	Not Applicable
2735	Integrated Flight Demonstrator (IFD)	94	1,484	1,500	1,500	Continuing	Not Applicable
2538	Integrated Communication-Navigation-Identification Avionics (ICNIA)	1,600	4,649	15,723	22,244	24,857	69,073

*Project 2538 was transferred from Program Element 63727F, effective in FY 1982.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Current avionics systems are major contributors to inadequate weapon system reliability and represent a substantial and increasing fraction of aircraft acquisition and support costs. The PAVE PILLAR program will exploit a number of recent innovations in systems architecture, semiconductor technology, computer standardization, and computer software to integrate and automate avionics functions for advanced aircraft. Objectives include operational performance improvements, very high mission reliability, fault tolerance, substantial reductions in both acquisition and support costs and reduction of crew workload in dense threat environments.

3. (U) COMPARISON WITH FY 83 DESCRIPTIVE SUMMARY: ($ in thousands)

TOTAL FOR PROGRAM ELEMENT	6,774	16,421	34,566	---	Continuing	Not Applicable

In FY 82 $1.2M was reprogrammed into PE63205F to fund essential efforts that are necessary preliminaries to the planned PAVE PILLAR activities. In addition, $0.2M was used to investigate the applicability of avionics standards to the B-1B. Program was reduced by $8.1M in FY 84 and $16.6M in FY 85 to fund higher priority programs yet maintain a schedule which would allow knowledge from the PAVE PILLAR program to influence the Advanced Tactical Fighter program.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

Not Applicable

Program Element: #63253F Title: Advanced System Integration Demonstrations (PAVE PILLAR)
DoD Mission Area: #551, Electronics and Physical Sciences Budget Activity: #2, Advanced Technology Development

5. (U) RELATED ACTIVITIES:

PE 62204F, Project 2003, Avionics System Design Technology; PE 63203F, Project 2733, Advanced Reconnaissance Strike Radar; PE 63718F, Project 2432, New Threat Warning System, and PE 62204F, Project 6095, Inertial Reference and Guidance will use the ground integration laboratory developed within this program. PE 63226F, DOD Common Programming Language (Ada) Advance Development, and PE 63728F, Advanced Computer Technology will provide Ada support software products for use by this program for application to avionics related software developments. Close coordination between this program and PE 63601F, Project 670A Ordnance Technology, will be maintained to insure successful implementation of MIL-STD-1760, Aircraft-to-Stores Interface. Close coordination with PE 63231F, Project 2829, Cockpit Automation of Technology, will be maintained to insure appropriate use of new automation, control, and display concepts. Several items of work being accomplished under PE 62204, Project 2003, are being partially funded by PAVE PILLAR and will be transitioned into the PAVE PILLAR baseline. These efforts are: Airborne Electronic Terrain Map System, a Multi-bus Avionics Architecture Design Study, and a Video Information Distribution System Study. The PAVE PILLAR program will use hardware developed under PE 63452, Project 2700, Very High Speed Integrated Circuits, and will provide funding to that element as required to procure the necessary items.

6. (U) WORK PERFORMED BY:

Current efforts are being performed by Boeing Military Airplane Company, Seattle WA, General Dynamics Corporation, Ft Worth, TX, Grumman Aerospace Corporation, Bethpage NY, International Telephone and Telegraph Avionics Division, Nutley NJ, McDonnell Douglas Corporation, St Louis MO, Northrop Corporation, Hawthorne CA, and TRW, Incorporated, San Diego CA. The in-house organization reponsible for the program is the System Avionics Division, Avionics Laboratory, Wright-Patterson Air Force Base, Ohio.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

Project 2735, Integrated Flight Demonstrator: This Project will provide flight validation of the technology and system implementations developed and/or integrated under Project 2734, Advanced System Avionics. A secondary objective of the Project is to reduce the cost of avionics flight testing by providing a flexible test bed aircraft containing the necessary core avionics and instrumentation to support quick turnaround testing of developmental equipment. The Project was an FY 82 new start. FY 82 funds were expended to install a combat effectiveness model in the evaluation facility. Funds in FY 83 will be used to accomplish system definition and preliminary flight testing of inertial navigation algorithms. System definition will be completed in FY 84 and system design will be initiated.

Program Element: #63253F Title: Advanced System Integration Demonstrations (PAVE PILLAR)
DoD Mission Area: #551, Electronics and Physical Sciences Budget Activity: #2, Advanced Technology Development

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: 2538, Integrated Communication Navigation Identification Avionics (ICNIA)

A. Project Description: The objective of the ICNIA Project is to develop, fabricate, test, and evaluate an advanced development model (ADM) version of an integrated communication, navigation, and identification (CNI) avionics system. The Project is needed as the first step to overcome weight, size, cost, logistics, and maintenance problems as well as increased pilot workload created by the proliferation of unique, single function C, N, and I systems. These systems lack a flexible growth capability to meet the dynamic mission requirements and threat environments of the future. These systems are being developed using existing technology rendering the systems obsolete by the time operational capability is achieved. The ICNIA Project will seek to (a) demonstrate a synergistic, integrated subsystem approach to avionics for all CNI functions in the 2MHz to 2GHz spectrum; (b) test and evaluate the ADM on the Integrated Electromagnetic System Simulator (IESS), a system to be developed to simulate the total electromagnetic signal environment of a modern tactical aircraft operating in a real world hostile environment; and (c) develop a detailed set of specifications to be used as a basis for engineering development and production of ICNIA terminals.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments:

A memorandumn of agreement (MOA) was signed with the US Army Avionics R&D Activity (AVRADA), Ft Monmouth NJ, thus establishing ICNIA as a joint program. The US Army is funding approximately 16.5% of the 2538 Project. The determination and findings (D&F) document for IESS was approved thereby establishing authority to negotiate the contractual effort.

(2) (U) FY 1983 Program:

The ICNIA System Definition contracts will be completed. The ICNIA ADM dual award and IESS contracts will begin.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request:

The ICNIA ADM and IESS efforts will continue. The FY 1984 funds of $13,133,000 are being requested to fund the completion of the ICNIA ADM system design and to develop the ADM breadboards to be used as the foundation of the ICNIA ADM terminal. An independent analysis of the ADM hardware and software designs will continue. The IESS system definition effort will be completed with detailed system design to follow. The cost estimate is based on estimates by Air Force engineering and procurement personnel predicated on experience with similar programs.

(4) (U) Program to Completion:

The ICNIA ADM will be developed, fabricated, tested, and evaluated. The ADM will be tested using IESS and will be flight tested using the PAVE PILLAR aircraft. The IESS will be developed, fabricated, and tested for proper operation in order to provide a hot bench test of the ICNIA ADM.

C. (U) Major Milestones: Not Applicable

(U) Project: 2734: Advanced System Avionics (ASA)

A. (U) Project Description:

The Air Force is presently faced with significant and rising development, operational, maintenance, training and support problems as a result of requirements for the expanded use of avionics to achieve multimission capabilities for aircraft. Proliferation of hardware and software, coupled with parallel growth of support equipment, maintenance, training, etc, are incurring costs that are becoming unaffordable. The ASA Project will exploit a number of recent innovations in system architecture, semiconductor technology, computer standardization, and computer software to integrate the avionics functions of advanced aircraft to obtain operational performance improvements, very high mission reliability, fault tolerance and substantial reductions in both acquisition and support costs. It is estimated that through integration and automation, the probability of survival in a dense threat environment can be increased as much as 50%. Further, by reduction of the numbers of cables and connectors and by the application of fault tolerant techniques, the mean time between failure of the system can be increased by a factor of five. Integrated diagnostics can halve the mean-time-to-repair. Higher levels of automation will allow crew members to concentrate their attention on top-level mission management functions. In summary, significant availability and survivability improvements are expected. The ASA Project will address the development of architectural and integration concepts which will provide system designs to obtain the improvements stated above.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments:

Five parallel contracts were awarded to major airframe contractors. The purpose of these efforts is to identify the requirements for future tactical missions and to define a generic avionics architecture which can fulfill these requirements. Dual contracts were awarded to develop top-level specifications for a MIL-STD-1750A processor using technology developed on the Very High Speed Integrated Circuit Program. An effort was commenced to define, design and fabricate a video data bus for application to PAVE PILLAR and the F-16. A simulation laboratory upgrade was initiated to provide support software capabilities and real-time man-in-the-loop simulation facilities for on-site verification and validation demonstrations of PAVE PILLAR concepts and technologies.

Program Element: #63253F Title: Adva·iced System Integration Demonstrations (PAVE PILLAR)
DoD Mission Area: #551, Electronics and Physical Sciences Budget Activity: #2, Advanced Technology Development

(2) (U) FY 1983 Program:

System definition efforts will continue. The design for the VHSIC computers will be completed, as will the design for the video bus subsystem. Contracts will be awarded to commence an on-site integration and validation effort, a wide band multiplex bus to provide a capability of resource sharing between subsystems, an advanced digital avionics map subsystem, a common signal processor for use in all ASA subsystems, and an effort to integrate the ASA simulation support facility. An effort will commence to host and evaluate the new DOD higher order language, Ada. In-house efforts to provide a baseline for performance improvement and availability enhancement will continue.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request:

Nearly $11 million of the programmed FY 1984 funding will be required to fulfill ongoing contract obligations described in prior paragraphs. A major new start in FY 1984 is the dual-award effort for system design and development. Results from the five definition contracts will be evaluated and incorporated into a specification for final system design. Two contractors will be chosen to participate through the design phase. At the end of the design phase a single contractor will be chosen to proceed through system development and flight test. High technology developments which will be integrated and evaluated on-site during FY 1984 include the Airborne Electronic Terrain Map and the video bus. A contract to develop an advanced symbol generator for use in man-in-the-loop simulations will be awarded. Cost estimates have been generated by Avionics Laboratory engineers and procurement specialists based on experience with prior efforts and programs. Nearly all data is based upon competitive procurement procedures. The estimates are current (within six months) and considered reasonably accurate.

(4) (U) Program to Completion:

This is a continuing program.

C. (U) Major Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63259F
DOD Mission Area: #551, Electronic and Physical Sciences (ATD)

Title: Cartographic Applications
Budget Activity: #2, Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT			1,299	2,097	7,000	10,396

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Cartographic Applications program directly supports Air Force users and developers of tactical and strategic systems whose performance is dependent upon the use of digital cartographic data. Numerous advanced Air Force systems are being developed and fielded which are dependent upon unique digital representations of the earth's surface (terrain, structures, etc.) to accomplish their missions (i.e., cruise missiles, simulators.) The objective of CATSS is to consolidate requirements for digital cartographic data, curtail the proliferation of system specific data bases required to support those requirements and develop techniques and algorithms to more effectively exploit that data to enhance system performance. Program emphasis will be on developing data base structures which support multiple Air Force system requirements, applications algorithms to more efficiently manipulate/transform/exploit the data and techniques to assist users/developers to more accurately define their requirements. There will be two output products. The first will be a single Air Force specification for its future digital cartographic data base needs to be provided to Defense Mapping Agency (DMA) for inclusion in the late 1980s development of a DMA master data base. This program will satisfy the Air Force responsibility to define and verify the correctness of that required Air Force input and is the only opportunity the Air Force will have to impact that critical master data base design. The second product will be delivery of a set of digital cartographic data support tools to weapons systems developers to allow them to improve and verify their systems designs by using the actual Air Force data base elements during their experimental design phase. All Air Force major commands needing digital cartographic data have reviewed and concur in this program. A conservative estimate of potential savings is 25 million dollars annually.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

				890	2,345		

Congress has not appropriated FY 1983 funds for this program. The change in the FY 1984 funding reflects restructuring of the program for an FY 1984 start.

Program Element: #63259F
DOD Mission Area: #551, Electronic and Physical Sciences (ATD)

Title: Cartographic Applications
Budget Activity: #2, Advanced Technology Development

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands). Not applicable.

5. (U) RELATED ACTIVITIES: Supporting exploratory development activities are conducted in PE 62702F, *Command and Control and Communications* (C^3). Other related work is on-going in PE 63701F, Mapping and Charting, and PE 64701B, DMA Mapping and Charting and Geodesy. There are two preliminary definition efforts on-going in Program Element 62702F, Command, Control and Communications in FY 1982 and FY 1983. These efforts will identify and technically consolidate all Air Force projected digital data requirements. The results of these efforts, one for strategic needs, one for tactical, will be the basis for the development of the Air Force consolidated requirements specifications in this program. The Army and Navy also have developments using digital cartographic data. The Army, for example, needs data for specific systems such as Pershing and Firefinder. However, the Air Force is the biggest user of this data (70 percent) and to include other Service's needs in the initial program would introduce unacceptable technical risk. Risk is already a factor since the Air Force has already identified more than 50 developing systems needing this data. Other Service developments will be included in this program where useful and all users will be able to use the developed tools.

6. (U) WORK PERFORMED BY: In-house efforts and contract monitoring will be done at the Rome Air Development Center, Griffiss AFB, NY.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

(U) Project: #2810, Digital Mapping and Charting Technology

A. (U) Project Description: This project will technically validate consolidated future Air Force requirements for digital cartographic data. It will construct a sample of a data base segment which will include all the validated features the Air Force will need and will experimentally test the adequacy of the data base elements so a specification can be provided to the Defense Mapping Agency (DMA). This will insure that the master data base DMA constructs includes the largest possible set of foreseeable Air Force weapon system needs. This project will also develop an interactive support facility in which weapons developers using digital cartographic data can experimentally verify and test their digital cartographic data subsystems using the universal data base, greatly reducing overall system cost and risk. Without this facility, future systems will continue to needlessly duplicate developments and will continue to lay overlapping data base requirements on DMA.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Not applicable.

(2) (U) FY 1983 Program: Not applicable.

Program Element: #63259F
DOD Mission Area: #551, Electronic and Physical Sciences (ATD)

Title: Cartographic Applications
Budget Activity: #2, Advanced Technology Development

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Efforts will use the output of exploratory development to develop the Air Force specification for the digital data base. The structure of the data base will be formed and an experimental model for verification will begin development. Transition of a completed Air Force specification and sample data base for input to Defense Mapping Agency is planned for 1987. Data base transformation tools and manipulation tools for developers of strategic and tactical systems will begin development. A small computer to host the software tools and data base will be acquired. A flexible design capability consisting of an interactive computer-based set of tools for use with digital cartographic data bases is planned for completion in 1988 and will transition to weapons system developers as a permanent, standardized facility. Without this capability, Air Force systems needing digital cartographic data in the future will not be deployable because the demand for unique data bases will out strip the producers capability to provide them on schedule and the Air Force will not be able to fully exploit the military advantages of digitized terrain data.

(4) (U) Program to Completion: Software manipulation tools which will allow experimental systems design using the master data base will be developed based on consolidated needs of tactical and strategic systems developers. The tools and data base will be tested for accuracy and integrated in a support facility. Transition to an appropriate Air Force acquisition agency for operation as a permanent capability is planned for 1988.

C. (U) Major Milestones:

Milestones	Dates
Basic Functional Design Complete	August 1984
Date Base Implementation Complete	May 1986
Design Tools Complete	May 1986
Integrated Facility Transition	October 1988

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63302F | Title: Advanced Missile Propulsion
DOD Mission Area: #553 - Engineering Technology (ED) | Budget Activity: #2 - Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimate Cost
	TOTAL FOR PROGRAM ELEMENT	6,629	0	3,333	5,507	Continuing	N/A
6339	Air-Launched Missile Propulsion	553	0	1,406	1,745		
6340	Space Systems Propulsion	3,012	0	1,927	3,762		
6341	Ballistic Missile Propulsion	864	0	0	0		
2445	Advanced Air-Breathing Propulsion	2,200	0	0	0		

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Advanced rocket propulsion system options to provide increased tactical and strategic weapons system effectiveness are investigated in this advanced development program element. This program provides an assessment of performance, cost, reliability, and service life of advanced rocket propulsion concepts to provide transition of the advanced development technology to the system developers and users. Technology advancement is carried out in three mission oriented areas: air-launched missiles, space systems, and ballistic missiles. There will be no advanced air-breathing (ramjet) propulsion work after FY 1982; the air-breathing project has been eliminated from this program element.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

7,174	894	1,279

Reduction in FY 1982 reflects the decreased number of low temperature propellant tests in Project 6341. The FY 1983 program was zeroed in the FY 1983 appropriations. The increase in FY 1984 provides for an FY 1984 start of the Advanced Strategic Air-Launched Missile Propulsion task to meet Advanced Air-to-Surface Missile (AASM), Conventional Standoff Weapon, or anti-satellite requirements.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #63302F
DOD Mission Area: #553 - Engineering Technology (ED)

Title: Advanced Missile Propulsion
Budget Activity: #2 - Advanced Technology Development

5. (U) RELATED ACTIVITIES: Technology programs to demonstrate propulsion and motor component feasibility are initially accomplished in exploratory development under Program Element 62302F, Rocket Propulsion. Coordination of efforts in this area are through the Joint Army-Navy-NASA-Air Force Interagency Propulsion Committee, and through working level meetings and inter-service committees. This program element provides technology for the following program elements: PE 64314F, Advanced Medium Range Air-to-Air Missile and PE 64411F, Space Transportation System Acquisition.

6. (U) WORK PERFORMED BY: Management of this effort is provided by the Air Force Rocket Propulsion Laboratory, Edwards Air Force Base, California. All work is done under contract. The top five FY 1982 contractors were: Hughes Aircraft Company, Canoga Park, CA (Project 2445); Hercules Incorporated, Cumberland, MD (Project 6339); United Technologies Corporation (Chemical Systems Division), Sunnyvale, CA (Project 6340) and Atlantic Research Corporation, Alexandria, VA (Project 2445). There were three other contractors with contracts totaling $850,000.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: Space Systems Propulsion. The first task in this project is the demonstration of a modular/storable space propulsion system which will be used for evasive maneuvering to enhance satellite survivability against a growing anti-satellite threat. Also, this propulsion technology will provide a 140 percent payload growth capability for spacecraft deployment stages operating out of the Shuttle. The modular aspect (the clustering of propellant tanks and engines) allows for the propulsion system to be embedded in a satellite or to operate as a separate stage. The versatility of the modular approach is unlimited and provides for a great deal of mission flexibility. The second task will develop cryogenic, toroidal propellant tank technology for a compact propellant feed system. A toroidal liquid oxygen tank used on an upper stage operating out of the space shuttle cargo bay can accommodate payloads 40-42 feet in length, and can provide a 38 percent increase in payload carrying capability over the Shuttle/Centaur G stage. Achievements in FY 1982 include Two full-scale motor firings demonstrating the feasibility of an improved performance space motor. The motor technology has already transitioned to the solid motors for the Global Positioning Satellite and the Defense Meteorological Satellite Program. Milestones in FY 1983-1984 will be to complete the initial designs of the modular/storable space propulsion system and the compact cryogenic propellant feed system. The modular/storable space propulsion system and the compact cryogenic propellant feed system are the two new starts for FY 1984.

B. (U) Project: Air-Launched Missile Propulsion. This effort will demonstrate an advanced strategic attack missile propulsion system. The integration of radial pulse motor technology with lightweight composite motor case technology will allow for a missile that is half the volume, two-thirds the weight and has the capability to double the range over air-launched strategic missiles currently in use. The most time critical mission that requires these capabilities is the Advanced Air-to-Surface Missile (AASM). Being able to incorporate the new technologies makes the AASM a true force multiplier over the current SRAM. This technology also supports the Conventional Standoff Weapon development.

Program Element: #63302F
DOD Mission Area: #553 - Engineering Technology (ED)

Title: Advanced Missile Propulsion
Budget Activity: #2 - Advanced Technology Development

This advanced air-launched propulsion technology could also be used for providing an increased capability to the current air-launched anti-satellite defense system. Achievements in FY 1982 include the demonstration of an air-launched radial pulse motor that can provide growth capablity for AMRAAM doubling its range capability. Milestones in FY 1983-1984 will be to complete the initial designs of the Advanced Strategic Attack Missile motor and to complete the motor component evaluations.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63363F
DOD Mission Area: #553, Engineering Technology

Title: Hypervelocity Missile Program
Budget Activity: #2, Advanced Technology Development

1. (U) RESOURCES ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	10,070	992	974	0	58,534	71,470

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Hypervelocity Missile (HVM) is a small, low cost, hypersonic antivehicular missile which will be employed with our air-to-surface combat fighter aircraft to destroy multiple targets per pass in the high threat, high speed, low altitude environment. The HVM is designed as a low cost, highly reliable missile. This allows a high return on investment and high availability of the weapon system. It will allow the U.S. to purchase and carry enough antiarmor missiles to efficiently address Soviet armor and support vehicles. A laser radar fire control system will continue to be developed concurrently for the HVM program which will provide multiple kills per pass.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

6 70*	992	0**	0	0	9,962**

* AF internally reprogrammed 2,000 in FY 82 to accelerate development.

** FY 83 Descriptive Summary only listed funds necessary to accomplish concept validation. Requirements now reflect total expenditures necessary to finish full scale development of the total system.

4. (U) OTHER APPROPRIATION FUNDS: Not applicable.

5. (U) RELATED ACTIVITIES: The Multifunctional Infrared Coherent Optical Scanner (MICOS I) Program (PE 62204) provides a second contractural effort for development of the CO_2 scanning laser fire control system required for this missile.

6. (U) WORKED PERFORMED BY: Vought Corporation of Dallas, Texas, being managed by the Air Force Armament Laboratory (AFATL) at Eglin AFB, Florida. A portion of the guidance system (MICOS I) work is being accomplished by Ford Aerospace, through the Air Force Avionics Lab (AFWAL/AA) at Wright-Patterson AFB, Ohio.

Program Element: #63363F
DOD Mission Area: #553, Engineering Technology

Title: Hypervelocity Missile
Budget Activity: #2, Advanced Technology Development

7. (U) HYPERVELOCITY MISSILE (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984):

A. (U) PROJECT DESCRIPTION: The Hypervelocity Missile is a 5000 ft/sec, 50 lb, low cost ($5K class) antivehicular, multiple engagement weapon. This missile represents a completely different approach to killing armor than is used by current weapons, such as MAVERICK, HELL FIRE, and TOW. It uses a kinetic energy penetrator (rod or tube, instead of a chemical energy warhead) as the kill mechanism. Thus, it achieves a substantial reduction in missile size, weight, and cost, while dramatically increasing the missile's flight velocity and aircraft combat load. These characteristics provide a marked increase in firepower-per-sortie while simultaneously decreasing the aircraft's exposure time. The potentially high payoff of the Hypervelocity Missile is that it will enable the U.S. Forces to dramatically increase the weapons available and the armament carried per sortie. Additionally, the low cost per missile, combined with its simple employment procedures, will enable the tactical forces to train our aircrews to effectively use this munition.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) (U) FY 1982 Accomplishments: Funding constraints forced an early contractor down-select in Dec 81. In Jan 82, the program was restructured to reflect the available FY 82 funds. In May 82, the program passed the first major technical milestone when laser energy was successfully transmitted to the missile receiver in a free-flight environment. Between Jan and Jul 82, a Guidance Test Missile (GTM) was designed, fabricated, and integrated. The GTM hardware was successfully flight tested (two shots) in Oct and Dec 82 to demonstrate guidance/control accuracy of the HVM concept. During FY 82, the MICOS program progressed to completion of the Critical Design Review for the laser radar sensor hardware.

(2) (U) FY 1983 Program: A high-speed ballistic test has been successfully conducted which demonstrated the ability of the missile to achieve 5000 ft/sec. Two additional ground tests of the GTM will be conducted in Feb and Aug 83 to demonstrate the ability to guide and control a high-speed missile and to accurately impact a target. Present plans include one ground launched multiple missile guidance test in late FY 83 where two missiles will be simultaneously guided to two independent targets. This test will demonstrate the ability of the laser guidance system (LGS) to guide multiple missiles simultaneously.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The primary work to be accomplished in FY 84 will be extensive engineering design work on a small, lightweight, improved attitude control system (ACS). The ground test tech demo missiles (GTMs) fired in FY 83 were larger than the final HVM will be (66 vs 45-50 lbs). Also, the unique attitude control system in the GTM consisted of only 48 firing squibs, whereas the final HVM will require 120 squibs. Considerable engineering effort will be required to redesign this attitude control system and package it in a smaller, lighter-weight housing. This new ACS, along with the new flight-weight motor, will then be [illegible] in the current missile to conduct one high-speed ground test at White Sands Missile Range in late FY 84. [illegible] increased capability of the new ACS will be demonstrated by guiding the missile to a target at [illegible] line-of-sight angles than previously tested. The PRICE model (Program Review of Information for [illegible]

Program Element: #63363F | Title: Hypervelocity Missile
DOD Mission Area: #553, Engineering Technology | Budget Activity: #2, Advanced Technology Development

parametric cost estimating technique was used in establishing the FY 84 budget requirement, using historical data. The last comprehensive cost review for this program, which is currently in its advanced development stage, was made in Oct 82.

(4) (U) Program to Completion: Beyond FY 84, an aircraft compatible pod will be used for launching HVMs from an airborne platform. The laser radar software development must be completed as well as the software/hardware integration. The launcher design must be completed, and the FLIR FCS must undergo an aircraft captive flight test verification. Finally, the missile, launcher, and FLIR FCS must undergo a series of airborne tests culminating with multiple missiles being fired simultaneously. Improved laser radar design efforts will continue throughout the development phase to provide preplanned product improvement capabilities which will allow targeting and attacking up to ten targets per pass.

C. (U) MAJOR MILESTONES:

Milestones	Dates
1. Guidance Concept Demonstration Complete	Jul 83
2. HVM Design Complete	Dec 83
3. HVM Ground Tests Complete	Oct 84
4. Preliminary Fire Control System Design Complete	Oct 84
5. Captive Flight Test Complete	Oct 86
6. Flight Test Demonstration Complete	Oct 87
7. Laser Radar Fire Control System Design Complete	Oct 87

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63401F Title: Space Vehicle Subsystems
DOD Mission Area: Space Launch and Orbital Control, #410 Budget Activity: Advanced Technology Development, #2

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0	4,339	6,314	29,293	Continuing	Not Applicable
681D	Advanced Space Guidance Technology	0	1,700	3,018	6,100	Continuing	Not Applicable
682J	Advanced Space Power Supply Technology	0	1,700	1,700	3,800	Continuing	Not Applicable
688F	Advanced Satellite Secondary Propulsion Technology	0	0	0	1,300	Continuing	Not Applicable
2181	Advanced Space Computer Technology	0	680	1,325	16,909	Continuing	Not Applicable
2198	Advanced Space Technology Planning	0	259	271	1,184	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This applied, advanced technology program serves to define, develop and demonstrate new/improved space vehicle subsystem concepts/prototypes which support numerous DOD space programs and are essential for meeting DOD space mission needs in the late 1980s and 1990s. The primary objective of this program is to increase satellite survivability, autonomy, performance, reliability and lifetime. A secondary objective is accomplishment of the prime objective with lighter, less complex, and more economical subsystems than currently exist. Development efforts are in guidance, power supply, secondary propulsion, computer subsystems and the supporting technology planning.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

				Additional to Completion	Total Estimated Costs
RDT&E	0	4,339	6,523	Continuing	Not Applicable

(U) FY 84 estimate differs from the FY 83 Descriptive Summary due to change in inflation indices.

4. (U) OTHER APPROPRIATION FUNDS: N/A

5. (U) RELATED ACTIVITIES: The following relationships exist with other activities. Project 681D (Advanced Space Guidance Technology) receives inputs from Program Element (PE) #62204F (Aerospace Avionics). Project 682J (Advanced Space Power Supply Technology) receives power system technology inputs from PE #62203F (Aerospace Propulsion). Project

688F (Advanced Satellite Secondary Propulsion Technology) receives secondary propulsion technology inputs from PE 62302F (Rocket Propulsion). Project 2181 (Advanced Space Computer Technology) contains the Satellite Autonomy task which is being worked jointly with AFSC/NASA Space Technology Interdependency Working Group. Project 2181 also receives technology inputs from PE 63452F, Very High Speed Integrated Circuits; PE 63605F, Advanced Radiation Technology; PE 63728F, Advanced Computer Technology; and PE 64711F, System Survivability (Nuclear Effects). The Space Vehicle Subsystems program flight tests its payloads via PE 63402F (Space Test Program).

6. (U) WORK PERFORMED BY: The primary contractors are the following: TRW Inc., Redondo Beach, CA (Project 681D -- Multi-mission Attitude Determination and Autonomous Navigation system), Hughes Aircraft Co., El Segundo, CA (Project 682J -- Solar Cells and Batteries) and the Jet Propulsion Laboratory, Pasadena, CA (Project 2181 -- Satellite Autonomy), and General Research Corp., McLean, VA (Project 2198 -- Military Space Systems Technology Model). The Air Force Space Technology Center Detachment 1, Los Angeles, CA manages the program and executes Projects 681D, 2181, and 2198. The Air Force Aeropropulsion Laboratory, Wright-Patterson AFB, OH executes Project 682J, and the Air Force Rocket Propulsion Laboratory, Edwards AFB, CA executes Project 688F.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 84:

A. Project 681D, Advanced Space Guidance Technology. This project develops and demonstrates technology for space guidance and develops components which will provide autonomous, non-radiating navigation for satellites and improve inertial attitude reference accuracies. In FY 82 the Space Sextant was successfully integrated and flight tested on orbit. A final report on its performance will be published. In FY 83 work on the Multi-mission Attitude Determination and Autonomous Navigation task will be continued. Fabrication of a flight demonstration model will start in FY 84.

B. Project 682J, Advanced Space Power Supply Technology. This project develops and demonstrates power system technology for subsystems and components. These subsystems and components will have increased power output and lifetime; substantially reduced volume, cost, and weight; and increased nuclear and laser hardness. In FY 82 Gallium Arsenide (GaAs) solar cells were fabricated and delivered for spacecraft integration. These solar cells will be flight tested in low earth orbit in FY 83 on the Navy's Living Instrument Plume Shield experiment and on the NASA/Italy San Marco D/L spacecraft. Also in FY 83, fabrication and qualification of a large area Gallium-Arsenide solar panel will be initiated to prepare for a high radiation belt space flight demonstration. Development of a common pressure vessel for a multi-celled Nickel-Hydrogen battery will be initiated to provide a 25% weight reduction compared with single cells. Work will continue on these tasks in FY 84. Also in FY 84, planning will be initiated for a new High Energy Density Rechargeable Battery (HEDRB) based on DOE's research on Sodium-Sulfur batteries for electric vehicle applications. High Voltage High Power System (HVHPS) development will start in FY 85.

C. Project 2181, Advanced Space Computer Technology. This project develops and demonstrates technology for computer, memory storage, data preprocessor, and software subsystems and components. These subsystems and components will have increased radiation hardness to enhance satellite survivability, will decrease satellite-to-ground link requirements, and will have reduced weight, volume, power and cost relative to today's state-of-the-art technology. This project includes two tasks which will be initiated in FY 83: Space Hardened Electronics and Satellite Autonomy.

Program Element: #63401F Title: Space Vehicle Subsystems
DOD Mission Area: Space Launch and Orbital Control, #410 Budget Activity: Advanced Technology Development, #2

In FY 83 the necessary mission studies for the Space Hardened Electronics Task will be accomplished and tradeoff studies will be performed to select chip set technologies to be developed. In FY 83, development of an Autonomous Redundancy Management and Maintenance Subsystem (ARMMS) will be initiated. A ground demonstration of the ARMMS concept is scheduled for FY 86. ARMMS will reduce the need for ground commanding of satellites by autonomous management of spacecraft subsystems.

D. Project 2198, Advanced Space Technology Planning. This project develops tools for planning and management of technology development for advanced space systems through the Military Space Systems Technology Model (MSSTM). This modeling process includes (1) identifying and ranking major military space missions, (2) developing advanced space systems concepts, (3) identifying key technology needs, (4) creating technology development roadmaps, and (5) prioritizing technology development thrusts. The first edition of the MSSTM was published in 2Q FY 82. The second edition, including technology roadmaps, will be published in FY 83. The third edition, the first complete MSSTM including prioritizing technology thrusts, will be published in FY 84.

8. (U) PROJECTS OVER $10 MILLION IN FY 84: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63406F
DOD Mission Area: Space Launch and Orbital Control, #410

Title: Advanced Military Spaceflight Capability
Budget Activity: Advanced Technology Development, #2

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	Total for Program Element	0	0	2,758	3,838	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This applied, advanced technology program will establish a technology base suitable for development of responsive, flexible, and economical military space transportation systems in the 1990's. The program includes concept studies to expand the conceptual base to include several alternative configurations for earth launched and orbit transfer vehicles; utility analyses to determine the values of these configurations in performing various military missions in space; and identification and solution of long lead technology problems. This is a new start, technology development program. A Joint Mission Element Needs Statement (JMENS) exists for a Contingency Launch System (CLS). This technology development program will support this related JMENS which details the need for a military launch capability with enhanced responsiveness and survivability.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	0	2,670	3,366		Continuing	N/A

Program was a proposed new start in FY 83 but was zeroed by the Congressional Conference Committee during the FY 83 Authorization Bill deliberations. Report indicated that an attempt was being made to minimize new starts as overall budget control measure, with no specific objection cited to this program. FY 84 and FY 85 funding levels differ from the FY 83 Descriptive Summary due to one year shift in program schedule combined with changes in inflation indices.

4. (U) OTHER APPROPRIATION FUNDS: N/A

5. (U) RELATED ACTIVITIES: The following relationships exist with other activities. This program will receive inputs from NASA development studies relating to the Reusable Orbit Transfer Vehicle, Manned Orbital Transfer Vehicle, Shuttle Derived Cargo Vehicle, and Space Operations Center (SOC) concepts; and from DOD development studies relating to the Maneuvering Reentry Research Vehicle (MRRV). Military Space Mission Analysis studies are being conducted by the AFSC Space Division, and Military Spaceflight Systems Concept Identification studies are being conducted by the Air Force Wright Aeronautical Laboratories. Defense Advanced Research Projects Agency (DARPA) will conduct studies and wind tunnel tests relating to hypersonic maneuvering vehicles.

Program Element: #63406F Title: Advanced Military Spaceflight Capability
DOD Mission Area: Space Launch and Orbital Control, #410 Budget Activity: Advanced Technology Development, #2

6. (U) WORK PERFORMED BY: The Air Force Space Technology Center, Kirtland AFB, NM will manage the program. Technology development will be conducted by the Air Force Wright Aeronautical Laboratories, Wright Patterson AFB, OH and the Air Force Rocket Propulsion Laboratory, Edwards AFB, CA.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 84: This is the Department of Defense's only applied, advanced technology program for defining, developing and demonstrating space launch and orbital transfer vehicle technology required for military space mission support in the 1990's. FY 84 will be the first year that funds will be expended under this program element. Operational system definition studies will be conducted to define, for leading candidate spaceflight vehicles concepts, the methods, facilities, and support equipment necessary to operate selected vehicles. This will include logistics, command, control, communication, and primary and alternate basing. The vehicle concepts which show significant value will be evaluated for technology readiness to support a development effort. In those areas in which the supporting technology is found to be immature, technology development road maps will be developed to define technology goals, milestone dates, and related costs. The general areas of technology development will include airframe/spaceframe structures, thermal protection systems, primary propulsion, guidance and control, communications, ground support, operations, and life support systems.

8. (U) PROJECTS OVER $10 MILLION IN FY 84: None

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63410F Title: Space Systems Environmental Interactions Technology
DOD Mission Area: #552 - Environmental and Life Sciences Budget Activity: #2 - Advanced Technology Development,

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	1,000	2,557	3,740	34,703	42,000
2821	Space Systems Design and Test Standards	0	200	590	1,000	10,010	11,800
2822	Interactions Measurement Payload	0	600	1,400	2,100	16,800	20,900
2823	Charge Control System	0	200	567	640	7,893	9,300

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Environmental interaction impacts are anticipated as space operations shifts to larger, higher power, longer life, manned spacecraft. Effects of the space environment on large, high power-space systems are unknown. Physical processes and their interactions with spacecraft must be quantified to assure reliablility and survivability of projected space systems. Impacts, identified by preliminary studies, include: Spacecraft charging/discharging during high latitude reentry; defocusing of radar antenna and large system optics due to charging, plasmas and fields; limiting of large solar array efficiency due to power drain through the space plasma; damage to high power solar array produced by space plasma acceleration and focusing; limits on manned operations due to charging/discharging of surfaces; and decreases of material stability with associated increase of contaminant deposition from the space environment. This program counters adverse effects of the space environment on Air Force space systems by: developing and demonstrating design guidelines, test standards, computer codes and MIL-STDs for advanced space systems. A charge control system will be prototyped and space flight qualified to control electrical charge buildup on spacecraft. Program Element 63410F represents the Air Force advanced development portion of a National Aeronautics and Space Administration (NASA)/Air Force Systems Command (AFSC) Space Interdependency on Spacecraft-Environment Interactions Agreement. Engineering design tools, MIL STD, and spaceflight qualified charge control system will be delivered to system developers as they are completed for use in development of projected systems.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY ($ in thousands)

RDT&E	1,583	2,637

Difference in FY 1983 reflects Congressional reductions. FY 1984 difference is the result of inflation index adjustments.

4. (U) OTHER APPROPRIATION FUNDS ($in thousands): Not applicable.

Program Element: #63410F Title: Space Systems Environmental Interactions Technology
DOD Mission Area: #552 - Environmental and Life Sciences Budget Activity: #2 - Advanced Technology Development,

5. (U) RELATED ACTIVITIES: The principal related activity is the NASA(OAST)/USAF(AFSC) Space Interdependency on Spacecraft-Environment Interaction agreement of May 1980. Both NASA and AF programs are supplying the exploratory development technology which this program will transition into the solutions to specific space systems problems. A major Air Force input is from Project 7661 in Program Element 62101F, Geophysics, at the Air Force Geophysics Laboratory. Programs in the broad area of the space environment are also conducted by the Navy and the National Oceanic and Atmospheric Administration. When applicable to Air Force requirements, information gathered by others will be used in the AF programs. The work within PE 63410F is coordinated formally at the annual triservice apportionment review briefings to the Office of the Undersecretary of Defense for Research and Engineering and through the semi-annual meetings of the NASA/USAF Space Technology Interdependency Working Group. This program is coordinated annually with Air Force Systems Command Space Division, major developers of Air Force space systems.

6. (U) WORK PERFORMED BY: This combined in-house and contract program will be managed by the Air Force Geophysics Laboratory, Hanscom AFB MA.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 2821 - Design and Test Standards. In Project 2821, technology developments from ongoing NASA and AF exploratory development programs will be applied to develop design guidelines, test requirements, and Computer Aided Design (CAD) tools for the Shuttle and other large, high-power space systems. Environmental effects which will impact development and deployment of technologies in the Air Force System Commands Military Space Systems Technology Model will be identified in FY 1983 and FY 1984. The outline for a large, high power spacecraft Military Standard will be completed and assessment of charging/discharging impact on operations in polar orbit will be completed in FY 1984.

B. Project: 2822 - Interactions Measurement Payload (IMP). An Interactions Measurement Payload (IMP)for Shuttle will be developed and flown in FY 1987 to provide engineering data for formulation of MIL-STDs applicable to large space systems. The payload will verify environmental conditions on polar mission orbits and provide validation of the computer aided engineering design tools for large, high power space systems. Experiments will include electromagnetic interference and circuit upset characterization, pulse monitors, electrical properties degradation experiments, material change studies and panel integration experiments. The flight qualification of Project 2823, charge control system will be an integral part of the Interaction Measurement Payload. During FY 1983, engineering experiments for the IMP will be defined. In FY 1984, baseline definition and cost estimates for experiments will be accomplished.

C. Project: 2823 - Charge Control System. In Project 2823, a Charge Control System (CCS) will be designed, developed and flight tested to produce a small, spaceflight qualified system to actively control charge buildup on mission spacecraft. Design and development of the active charge control system will begin in FY 1983. System is based on concept demonstrated in exploratory development on satellite P78-2. Engineering design phase of charge control system will be completed in FY 1984.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63452F Title: Very High Speed Integrated Circuits (VHSIC)
DOD Mission Area: #521, Electronics and Physical Sciences Budget Activity: #2, Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
TOTAL FOR PROGRAM ELEMENT	79,647*	66,004	125,109	120,421	174,869	636,022

*Includes $14.1M of reprogrammed funds to be used in FY 1983.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This is a Tri-Service program to develop two generations of integrated circuits with very high data processing capacity for a wide range of military systems. Initial applications will be in digital signal processors for radar, antisubmarine warfare, communications, missile guidance, electronic warfare, and optical sensor systems. Payoff in these systems will include enhanced performance and reliability and reduced life-cycle cost. Many systems will not be achievable without this component technology. The program structure stresses ready access to the technology by military system designers and rapid introduction of these components into the operational inventory. By Congressional direction, the program is centrally managed in the Office of the Undersecretary of Defense for Research and Engineering, and the Air Force budgets for and administers the total program funding.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	65,547	66,004	61,479		49,146	312,148

VHSIC was originally planned for completion in FY 1986. Recognizing that a concerted effort to identify and prepare for applications of the technology in operational systems is essential to avoid delays in obtaining VHSIC payoffs, the Department of Defense added $237.4M over the FY 1984-1989 period to the VHSIC budget. In FY 1984, the initial increment of this Technology Insertion funding is $21.8M. This funding will be used for system design tool development, pilot application projects, military qualification and hardening of VHSIC components, and other activities which are vital precursors to widespread employment of VHSIC. A further $90.0M over the FY 1984-1986 period has been added for yield enhancement in the VHSIC pilot production lines to ensure adequate quantities of chips are available at acceptable unit costs. The first increment of this funding is $45.0M in FY 1984.

4. (U) OTHER APPROPRIATION FUNDS: Not applicable.

Program Element: #63452F Title: Very High Speed Integrated Circuits (VHSIC)
DOD Mission Area: #521, Electronic and Physical Sciences Budget Activity: #2, Advanced Technology Development

5. (U) RELATED ACTIVITIES: This is a Tri-Service program with management and technical oversight executed by the Office of the Undersecretary of Defense for Research and Engineering. The Program Director, in the Office of the Undersecretary of Defense for Research and Engineering, coordinates the work within the program and work related to it. An Executive Committee chaired by the Deputy Undersecretary of Defense for Research and Engineering, Research and Advanced Technology with participation by the Services and other concerned agencies exercises oversight and sets program policy. Related activities include: Aircraft Avionics (PE 62202A); Electronic and Electron Devices (PE 62705A); Electron Device Technology (PE 62762N); Aerospace Avionics, (PE 62204F); Aircraft Avionics Equipment, (PE 63207A); Avionics, (PE 63202N); Advanced Device Development, (PE 63742N); Advanced Avionics for Aircraft, (PE 63203F); Electronic Warfare Technology (PE 63718F); and Advanced Systems Integration Demonstrations, (PE 63253F). In addition a major manufacturing technology program will be conducted to ensure VHSIC components are mature, available, and affordable. The Defense Nuclear Agency is conducting programs with all six VHSIC chip fabrication contractors to evaluate the use of state-of-the-art radiation hardening techniques to upgrade VHSIC pilot production lines to space and strategic hardening levels.

6. (U) WORK PERFORMED BY: The Office of the Undersecretary of Defense for Research and Engineering executes program management of Very High Speed Integrated Circuits. The work is monitored in the following organizations: Electronic Technology and Device Laboratories, Electronic Warfare Laboratory, and Communications Research and Development Command, all of Fort Monmouth NJ; Army Missile Command, Huntsville AL; Army Armament Research and Development Command, Dover NJ; Army Night Vision and Electro-Optics Laboratory, Fort Belvoir VA; Army Research Office, Research Triangle Park NC; Naval Electronic Systems Command, Naval Research Laboratories, both in Washington DC; Office of Naval Research, Arlington VA; Naval Air Development Center, Warminster PA; Naval Surface Weapons Center, Dahlgren VA and White Oak MD; Naval Weapons Center, China Lake CA; Naval Ocean Systems Center, San Diego CA; Air Force Wright Aeronautical Laboratories, WrightPatterson Air Force Base OH; and Rome Air Development Center, Griffiss Air Force Base NY and Hanscom Air Force Base MA. The major VHSIC contractors are TRW, Redondo Beach CA; Westinghouse, Baltimore MD; Hughes Aircraft Corp., El Segundo CA; Texas Instruments, Dallas TX; Honeywell Inc., Minneapolis MN; and IBM Corp, Manassas VA. There are nine additional contractors holding contracts totalling $10.8M.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not applicable.

8. (U) PROJECT: 2700, VHSIC (PROJECT OVER $10 MILLION IN FY 1984):

A. (U) Project Description: VHSIC contractors will deliver chip sets, brassboard demonstration subsystems, pilot production lines, computer-aided design tools, and government-funded technology. Over 60 systems in all three Services have been identified as prime candidates for VHSIC designs. Projected system payoffs include 5- to 10-fold reductions in size, weight, and power consumption; 10- to 100-fold increases in reliability and processing throughout; and significantly reduced costs of maintenance, supply, and modification. Program phases are as follows: Phase 1 - first generation militarized very large-scale integration technology using 1.25 micrometer geometries to fit 20,000-50,000 logic gates per chip; Phase 2 - second generation technology, using submicrometer geometries and 100,000 or more gates per chip plus yield enhancement and support for system applications of Phase 1 chips; Phase 3 parallel program of supporting technology efforts to meet needs and reduce risk in Phases 1 and 2.

Program Element: #63452F   Title: Very High Speed Integrated Circuits (VHSIC)
DOD Mission Area: #521, Electronic and Physical Sciences   Budget Activity: #2, Advanced Technology Development

8. (U) PROJECT: 2700, VHSIC (PROJECT OVER $10 MILLION IN FY 1984): (Continued.)

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Substantial progress was made under six Phase 1 contracts on defining chip fabrication processes, developing and integrating computer-aided design tools, and completing initial chip designs. Results from Phase 3 in areas such as high resolution lithography and fault tolerant design techniques were fed into Phase 1. In addition, the Phase 1 contractors established requirements for the Phase 2 chip generati nd began intensive development of processes to extend existing technology into the submicrometer regime.

(2) (U) FY 1983 Program: Phase 1 chip designs and processing schedules will be completed. basis will shift to establishing pilot production lines and completing brassboard designs. As Phase 3 efforts completed, their results will be incorporated into Phase 1; a limited number of additional Phase 3 contracts ma funded to address deficiencies which surface in Phase 1 and to prepare the basis for Phase 2. To allow the mo d possible transition of Phase 1 components into operational systems, work will begin on a VHSIC Hardware Descr Language, on qualification of Phase 1 chips to military environmental and reliability levels, and on design and sibility studies aimed at inserting VHSIC into specific systems.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: This request reflects the Defense Department's response to the desire expressed by Congress that VHSIC planning be refined and the resources needed to complete and apply the technology be identified. The original technology development plan has been augmented with design, technology validation, and applications support activities which are essential to ensure that VHSIC is exploited as widely and rapidly as possible. The resource requirements were derived during the first quarter of FY 1983 from a detailed analysis of VHSIC by the Defense Science Board, from application plans developed during FY 1982 by the Services, from extensive consultation with experts in industry, universities, and government, and from experience accumulated in VHSIC to date. Planning for the remainder of the program has been revised and made explicit. In FY 1984, Phase 1 will be completed and Phase 2 will begin. Phase 2 will comprise four major initiatives: Phase 1 yield enhancement, submicrometer technology development, system design tool development and integration, and insertion of Phase 1 components in specific systems. The first of these, resulting from analyses carried out during 1982 of the producibility and availability of VHSIC chips, is a three year yield enhancement effort to improve Phase 1 pilot line yield (i.e., the fraction of total chips which are functional after processing) by a factor of ten and reduce device cost. This work is key to assuring adequate quantities of chips to support system applications and to high chip reliability. The second initiative will be a three-year effort along the lines of Phase 1 to produce submicrometer chips, brassboards and pilot production lines. The third will develop a comprehensive, integrated, computer-based VHSIC System Design System; this facility will be the vital link in providing access to the technology for the defense industry and in efficiently implementing VHSIC designs. The fourth initiative involves design projects, feasibility studies, prototypes, and the like aimed at achieving a range of system applications as a springboard to the desired widespread, routine use of VHSIC. FY 1984 will thus see both intensive efforts to exploit the results of Phase 1 and the launching of the second VHSIC generation.

Program Element: #63452F Title: Very High Speed Integrated Circuits (VHSIC)
DOD Mission Area: #521, Electronic and Physical Sciences Budget Activity: #2, Advanced Technology Development

8. (U) PROJECT: 2700, VHSIC (PROJECT OVER $10 MILLION IN FY 1984): (Continued.)

B. (U) Program Accomplishments and Future Efforts: (Continued.)

(4) (U) Program to Completion: The yield enhancemenent initiative will end in FY 85 and will result in a tenfold improvement in Phase 1 pilot production line yields. The submicrometer technology initiative of Phase 2 will end in FY 1987 with delivery of chips, pilot lines, and brassboards. An initial VHSIC System Design System will be assembled in FY 1986 and tested with numerous VHSIC users. A refined design system incorporating needed improvements will be completed by FY 1988. The technology insertion initiative for Phase 1 components will run through FY 1988, by which time funding from users is expected to sustain the production and design facilities. A similar activity for the second, submicrometer component generation will be conducted in FY 1987 and FY 1988.

C. (U) Major Milestones: Not applicable.

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FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63601F
DOD Mission Area: Engineering Technology (ATD), #553

Title: Conventional Weapons Technology
Budget Activity: Advanced Technology Development, #2

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	22,484	20,017	32,032	19,086	Continuing	Not Applicable
670A	Ordnance Technology	6,343	7,780	9,405	3,776	Continuing	Not Applicable
670B	Air-to-Surface Guided Weapons Technology	14,081	8,090	22,800	10,000	Continuing	Not Applicable
670E	Air-to-Air Technology	450	1,380	2,000	2,010	Continuing	Not Applicable
670F	Aircraft Gun Technology	1,510	2,000	4,902	1,800	Continuing	Not Applicable
670G	Advanced Explosives	100	767	2,900	1,500	Continuing	Not Applicable

(U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Includes all Air Force advanced development effort for technology base demonstrations of advanced non-nuclear aircraft armament and weapons guidance technology. New weapons concepts and technology applications are developed and tested to demonstrate feasibility, effectiveness and operational potential. This program serves as the basis for follow-on system development, and advanced prototyping programs. It is the only program for Conventional Weapons Technology (6.3) within the Air Force.

(U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

RDT&E	22,220	20,017	17,930	Continuing	Continuing	Not Applicable

Funds increased in FY 84 are for the demonstration of the AXE concept ($10M) and the increased scope of the improved 2000 lb bomb and autonomous guided bomb guidance.

(U) OTHER APPROPRIATION FUNDS: Not Applicable

Program Element: #63601F Title: Conventional Weapons Technology
DOD Mission Area: Engineering Technology (ATD), #553 Budget Activity: Advanced Technology Development, #2

(U) RELATED ACTIVITIES: This program demonstrates non-nuclear technology advances initially investigated in Air Force exploratory development Conventional Munitions (PE 62602F), Aerospace Avionics (PE 62204F) and Rocket Propulsion (PE 62302F) programs. Coordination is maintained with Advanced Avionics for Aircraft (PE 63203F), Digital Avionics Information System (PE 63243F) and NAVSTAR/Global Positioning System (PE 64778F) programs. Outputs from this program are to: The Advanced Missile Subsystem Demonstration (PE 63313F), Advanced Short Range Air-to-Air Missile Technology (PE 63380F), Advanced Medium Range Air-to-Air Missile (AMRAAM) (PE 63370F/64416F), Advanced Attack Weapons (PE 63609F), Armament/Ordnance Development (PE 64602F), Close Air Support Weapons System (PE 64608F), Air Delivered Land Mines (PE 64610F), and Surface Defense Suppression (PE 64733F) programs. Tri-Service coordination is accomplished through the Joint Technical Coordinating Group (JTCG) for Munitions Development, the JTCG for Munitions Effectiveness and the Joint Service Guidance and Control Committee (JSGCC) for guidance and control activities. Other joint specialized committees have been formed for specific technology sub-areas. Jointly funded/sponsored tasks in this program include the Ring Laser Gyro program and the demonstration of Millimeter Wave/Synthetic Aperture Radar seeker technology on adverse weather seekers. International cooperation and coordination is under the auspices of The Technical Cooperation Program (TTCP) and various specific country-to-country data exchange agreements, such as the NATO infrared and millimeter wave target/background signature measurement program.

(U) WORK PERFORMED BY: The Air Force Armament Laboratory, Eglin Air Force Base, FL is the responsible technical activity for this program. Test facilities at the Armament Division, Eglin Air Force Base, FL; the Arnold Engineering Development Center, Arnold Air Force Station, TN; and the Central Inertial Guidance Test Facility, Holloman Air Force Base, NM support this program. Major contractors on this program are: Brunswick, Costa Mesa, CA; McDonnell Douglas, Huntington Beach, CA; General Dynamics Corporation, Pomona, CA; Texas Instruments, Dallas, TX; Honeywell Inc., Minneapolis, MN; Hughes Aircraft Company, Canoga Park, CA; Martin Marietta, Orlando, FL; Teledyne Systems Company Northridge CA; Lear Seigler, Grand Rapids, MI; SRI International, Menlo Park, CA; Motorola, Scottsdale, AZ; Ford Aerospace, Newport Beach, CA. Eighteen other contractors and non-Air Force Government activities hold additional contracts.

Program Element: #63601F Title: Conventional Weapons Technology
DOD Mission Area: Engineering Technology (ATD), #553 Budget Activity: Advanced Technology Development, #2

(U) PROJECTS LESS THAN $10M IN FY 84:

A. (U) Project 670A, Ordnance Technology:

In FY 83, change one to MIL-STD-1760 will be published that establishes a common electrical connector specification for Air Force and Navy aircraft/store interfacing. Joint development of the logical portion of the standard will continue and the NATO ratification of MIL-STD-1760 will be pursued by the NATO Air Armament Working Party. Development of an Advanced Stores Management System which implements the architecture required to manage future store/aircraft functions thru the MIL-STD-1760 interface will continue. The Low Altitude Dispenser (LAD) technology development will be continued which will provide lifting, standoff, and off-axis delivery capability. A German Ministry of Defense program will be completed to demonstrate the LAD tube dispensing technique proposed for the German MWX dispenser concept. Continue the development of an Anti-material Incendiary Submunition. Initiate development of a programmable area denial submunition. Modular Fuze brassboard fuze control unit (FCU) and safe arm fire (SAF) modules were successfully laboratory and wind tunnel tested. Modular Fuze contract was modified to provide demonstration fuzing for the kinetic energy penetrator (KEP) submunition. The Standardized Avionics Integrated Fuzing (SAIF) development including a joint demonstration program with the Advanced Fighter Technology Integration (AFTI) was initiated. Demonstration of depleted uranium warhead technology concepts for defeat of advanced armor will be completed. The Improved 2000 lb warhead program will be initiated.

In FY 84, the final change to MIL-STD-1760 will be published that establishes the logical data format between aircraft and stores. Prototype hardware will be delivered under the Advanced Stores Management System contract and will be used for developing stores management design guides that minimize the cost of weapon integration and maximize the utility of future aircraft and stores. A powered Low Altitude Dispenser technology development will be continued which will provide standoff and off-axis delivery capability as well as optimum patterns for the submunitions deployed. Complete the development of an Anti-material Incendiary Submunition which combines self-forging fragmentation technology to provide an effective submunition for defeat of diesel fueled and lightly armored targets. Continue development of a programmable area denial submunition. Complete the development of Standardized Avionics Integrated Fuzing which uses aircraft avionics data to provide real time optimum fuze and weapon control for increased tactical flexibility and weapons effectiveness. Continue the 2000 lb warhead program.

B. (U) Project 670E, Air-to-Air Technology:

In FY 83, initiate an advanced All-Weather Seeker development which will demonstrate advanced seeker guidance for air-to-air missile application and advanced the state-of-the-art of multi-mode seeker technology.

In FY 84, the advanced seeker development program will continue which will demonstrate guidance for air-to-air missile application and advanced state-of-the-art multi-mode seeker technology.

Program Element: #63601F	Title: Conventional Weapons Technology
DOD Mission Area: Engineering Technology (ATD), #553	Budget Activity: Advanced Technology Development, #2

C. (U) Project 670F, Aircraft Gun Technology:

In FY 83, continue development of improved 30mm ammunition including initiation of an alternate high velocity cartridge which utilizes molded propellant to increase propellant packing density/muzzle velocity. Initiate advanced development of the sabot diverter to insure compatibility of the improved 30mm API ammunition with the GAU-8/A-10 system for use against advanced armor. Initiate development of 30mm telescoped ammunition to obtain the necessary muzzle velocity and lethality for the advanced aircraft gun system. Issue contracts for the detailed design (Phase I) of an Advanced Aircraft Gun.

In FY 84, complete development of the improved 30mm API cartridges and related sabot diverter; final development tasks include improved 30mm ammunition/sabot diverter/GAU-8/A-10 compatibility and environmental testing. Initiate development of a gun pod sabot diverter to insure compatibility of the improved 30mm API ammunition with future gun pod systems for use against advanced armor. Continue development of 30mm telescoped ammunition including both target practice and combat warheads; development tasks include firing of the 30mm target practice ammunition in a dynamic test fixture to simulate firing loads in a 3000 shots-per-minute gun system. Continue Phase I Advanced Aircraft Gun contracts to establish detailed gun and ammunition designs.

D. (U) Project 670G, Advanced Explosives Technology:

In FY 83, Ethylenediaminedinitrate - Ammonium Nitrate (EA) based explosives classified as AFX 400 will be prepared in 10,000 lb batches. Load specifications will be developed for bombs. Engineering studies will be initiated for AFX 400 production.

In FY 84, AFX 400 will be final qualified in GP bombs. Extensive safety and performance tests will be conducted and the decision to load the next buy of MK-84 bombs with AFX 400 or tritonal will be made.

(U) PROJECTS OVER $10M IN FY 84:

(U) Project 670B, Air-to-Surface Weapons Technology:

In FY 83, the Tactical Global Positioning System Advanced Missile Receiver development will be completed. Flight testing will be initiated to test its utility as part of an advanced tactical midcourse guidance subsystem in the Midcourse Guidance Demonstration (MGD) program. Development of Tuned Rotor Gyro technology will be completed as part of the MDG program. The Joint Navy/Air Force Millimeter Wave/Synthetic Aperture Radar technology development for guidance application in standoff missiles will be completed to provide autonomous search, acquire, and track capabilities to defeat high value targets such as ships, airfields, and POL. Emitter Homing Technology will complete the development of a new seeker design for the Remotely Piloted Vehicle program for use against early warning/ground control intercept radars, noise modulated continuous wave jammers, and ground based satellite jammers. The Infrared High Value Target Acquisition program will continue with brassboard fabrication integration, and performance of captive flight testing to demonstrate the feasibility of attacking high value fixed targets with conventional tactical weapons utilizing a relatively low cost autonomous infrared seeker for terminal guidance. Initiate development of the Dynamically Tuned Rate Gyro system which will use proven technology to provide an inexpensive inertial system for tactical weapons with a flight time under two minutes. Initiate the Sidewinder Anti-Radiation Missile II guidancy system requirements study. Initiate the Advanced Anti-Armor Technology Demonstration program to demonstrate the capability of an autonomous millimeter-wave radar guided missile to reliably search, detect, acquire, and track to impact mobile armored targets.

In FY 84, complete development of technology under the Midcourse Guidance Demonstration (MGD) program for an all-weather, standoff delivery, low cost, digital guidance subsystem for tactical guided weapons. Complete testing to demonstrate the feasibility of the Tactical Global Positioning System Advanced Missile Receiver for position update for tactical guided weapons. Complete assessment of the Infrared High Value Target Acquisition program captive flight testing to demonstrate the feasibility of attacking fixed targets with conventional tactical weapons utilizing a relatively low cost, autonomous, infrared seeker for terminal guidance. Initiate an advanced development program to assess the feasibility of using the DOD standard Ada language in real-time embedded computer system. Initiate the demonstration of a Phase Nulling Gyro to show that use of solid state optical detection of rotation utlizing fiber optic sensors is not acceleration sensitive. Continue development of the Dynamically Tuned Rate Gyro system which will use proven technology to provide an inexpensive inertial system for tactical weapons with a flight time under two minutes. Complete the Sidewinder Anti-Radiation Missile II guidance system requirements study. Continue the Advanced Anti-Armor Technology Demonstration program to demonstrate the capability of an autonomous Millimeter-Wave radar guided missile to reliably search, detect, acquire, and track to impact mobile armored targets. Initiate the Advanced Autonomous Infrared Seeker program to develop and demonstrate an advanced, focal plane array, imaging infrared seeker for use against both armored vehicle targets and fixed high value targets.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 63603F Title: Space Laser Technology
DoD Mission Area: Directed Energy Technology, #554 Budget Activity: Advanced Technology Development, #2

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	20,000*	0	36,095	35,893	132,269	224,257
2848	System Definition and System Technologies	10,674	0	18,745	16,393	75,720	121,561
2849	Laser Technologies and Target Vulnerabilities	9,326	0	17,350	19,500	56,549	102,696

*Funded in Program Element 64406F, Project 2135, Advanced Systems. Forward funded by Congressional direction to cover FY 1983 requirements.

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: In May 1981, the Department of Defense (DoD) reported to Congress that, while space-based lasers had the potential to satisfy many DoD missions, a decision to commit to system development of space laser weapons was premature. Such a decision should not be made until uncertainties in technical feasibility, ultimate military utility, and cost effectiveness were resolved. This technology program will provide the basis for an informed decision [ ] on whether or not to initiate development of a system suitable for space-based test and demonstration. It is the Air Force element of a joint DoD (Air Force/DARPA/Army) program that will be executed in accordance with the "DoD Space Laser Program Plan" submitted to Congress on Jun 21, 1982. While exploitation of chemical laser technology is emphasized, development of shorter-wavelength lasers systems is also included. Potential missions for space-based lasers weapon systems include antisatellite operations and satellite defense [ ] and ballistic missile defense, CONUS and fleet air defense, interdiction of airborne targets, and precision strikes against ground targets [ ]

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in Thousands)

20,000	40,561 1/	37,104 2/	-	123,779 3/	221,444 3/

1/ Requested in FY 1983 President's Budget but not funded by the Congress.
2/ Inflation adjustments.
3/ Increases reflect zero funding in FY 1983 and resultant requirement for FY 1988 funding to complete efforts outlined in the "DoD Space Laser Program Plan."

4. (U) OTHER APPROPRIATION FUNDS: Not applicable.

Program Element: # 63603F Title: Space Laser Technology
DOD Mission Area: Directed Energy Technology, #554 Budget Activity: Advanced Technology Development, #2

5. RELATED ACTIVITIES: The nucleus of development within DoD for space laser technology is the DARPA TRIAD Program funded in Program Element 62711E, Projects EE-7, EE-8, and EE-12. Program Element 62711E, Project EE-7 contains the development for a major acquisition, tracking and pointing experiment - TALON GOLD (TG). The objective of TG is to [ ] Project EE-8, Program Element 62711E, is the high power chemical laser groundexperiment - ALPHA. The objective of ALPHA is to demonstrate a [ ] high-efficiency [ ] chemical laser in a ground-based facility to establish the feasibility of system performance levels required for space weapon application. Program Element 62711E, Project EE-12, is the Large Optics Demonstration Experiment - LODE. LODE will establish and demonstrate the performance level that can be obtained from a beam control optics system designed to operate in space in conjunction with a large aperture, light-weight, laser mirror. Program Element 62301E, Project ST-3, High Energy Laser Technology, supports the DARPA TRIAD Program. The objective of this related project is to develop the basic technology to provide improvements in laser device efficiency, wavelength and waveform, as well as advances in required optical components and ultra-precise beam pointing. Technology investigations conducted under Air Force PE 63605F (Advanced Radiation Technology) also contribute to this program.

6. (U) WORK PERFORMED BY: The Air Force Systems Command's Space Division, Los Angeles, CA, has overall management responsibility for this program. Space Division will perform directly those tasks involving system definition and utility analyses (including consideration of active and passive countermeasures), studies and analyses determining how to maintain mission effectiveness, surveillance/C^3 technology, and spacecraft technology. The Air Force Systems Command's Air Force Weapons Laboratory, Albuquerque, NM, is responsible for laser, optics, and beam control technology development, and target vulnerability and hardening countermeasures.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: System Definition and System Technologies, #2848

A. (U) Project Description: Under this project, the Air Force Systems Command's Space Division will conduct studies, analyses and system definition activities to (1) develop detailed concept definitions for total space laser weapon systems (2) establish space laser weapon military utility through extensive mission effectiveness analyses, (3) understand key technological and operational aspects with emphasis on system survivability, (4) refine system development planning to reduce uncertainties in cost and schedule estimates, (5) resolve surveillance and command/control uncertainties through architectural and requirements definition and (6) conduct technology risk reduction programs. The DARPA TRIAD will provide major technology inputs to support these efforts.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Funding for this project was provided under PE 64406F, Space Defense System in FY 1982. In July, 1982, funding was released to the Air Force and procurement activities were initiated to support the

Program Element: # 63603 Title: Space Laser Technology
DOD Mission Area: Directed Energy Technology, #554 Budget Activity: Advanced Technology Development, #2

studies, analyses and concept definition efforts to be conducted under this project. In accordance with Congressional direction (Authorization Conference Report/August 16,1982/pg 125), the bulk of the $20M provided in FY 1982 was "forward funded" into FY 1983 to cover FY 1983 activities.

(2) FY 1983 Program: Given the Congressional decision not to fund PE 63603F in FY 1983, the date for an informed decision on future development of space laser weapon systems will slip from [ ] The scope of the required studies, analyses and system definition activities remains unchanged. In November 1982, System Concept Definition studies were awarded by Space Division to (1) Martin Marietta with Aerojet Electro-Optics Division, ITEK, the United Technologies Research Center, Rocketdyne and Sundstrand, (2) Boeing Aerospace Company with Hughes Aircraft, General Electric, and Bell Aerospace, (3) Lockheed Missiles and Space Company with TRW, Inc., and (4) Rockwell International with Collins, Ford Aerospace, ITEK and Rocketdyne. A Red Team will be assembled to critique the Program Office's efforts and serve as a "devil's advocate." Space Division, in conjunction with the MAJCOMs and HQ USAF, will review the requirements for the space-based laser. They will complete development of an architecture defining what is required to maintain mission effectiveness in the presence of countermeasures. Work will continue on utility analysis, and technology efforts which support the surveillance, command, control and communications, and spacecraft segments.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The Space Division Program Office will continue definition of the most promising space-based laser weapon system concept definitions begun in FY 1983 after systems requirements are finalized. Results from ongoing survivability analyses will be fed back into the concept definition studies to refine system design concepts. Technical feasibility issues associated with all major weapon-system elements will be identified and potential solutions proposed. System cost-estimating techniques will be refined to more accurately predict development, deployment and operational costs for candidate systems. "Red Team" activities will concentrate on developing approaches to negate space laser weapon effectiveness. The Program Office will assess the utility analyses begun in FY 1982, and will provide guidance to in-house and contractual personnel on what additional studies are necessary. The Program Office will continue supporting technology efforts peculiar to a space-based laser weapon system.

This is a "level of effort" program in accordance with the May, 1981 commitment of the Deputy Secretary of Defense to augment DoD funding of space laser R&D. Cost estimates were developed by Air Force Systems Command and HQ USAF by first identifying those issues that must be resolved prior to an informed decision on space lasers and then estimating the minimum funding required to address these issues. This program is in the Concept Definition phase of systems development. The cost estimates contained in the June, 1982 "DoD Space Laser Program Plan" were reexamined in the Fall of 1982 following Congressional zeroing of the FY 1983 President's Budget Request for this program.

(5) Program to Completion: [ ] the Space Division Program Office will define the most promising system concepts for possible future development. A Development Plan with total system cost estimates will be developed. The results of the utility and cost effectiveness studies funded under this project together with the data Project 2149 (see Para 9) will provide the basis for a joint Air Force/Office of the Secretary of Defense Program Decision on whether or not [ ] The Program Office will continue to modify and reassess the analyses addressing system utility and maintenance of mission effectiveness through FY 1988. The feasibility of key components of C^3, surveillance, and spacecraft segments will be established [ ]

Program Element: # 63603 | Title: Space Laser Technology

DOD Mission Area: Directed Energy Technology, 554 | Budget Activity: Advanced Technology Development, #2

C. (U) MAJOR MILESTONES: | Date

(1) (U) Program Management Plan to Congress — June 1982
(2) Interim Decision — [ ]
(3) Program Decision

*Data presented in FY 1983 Descriptive Summary

(U) EXPLANATION OF MILESTONE CHANGES:

(2) (U) Reflects impact of Congressional decision not to fund the FY 1983 President's Budget Request for this program.
(3) (U) Same as 2 above.

9. (U) PROJECTS OVER $10 MISSION IN FY 1984:

(U) Project: Laser Technologies and Target Vulnerabilities, #2849

A. Project Description: This project funds Vulnerability and Hardness (V&H) and Feasibility Technology tasks. Any assessment of the ultimate military utility and cost effectiveness of space-based laser weapons is directly linked to the vulnerability and hardness (V&H) of candidate Soviet targets. Space-based laser weapon systems may have significant military utility if candidate targets are shown to be "soft" to incident laser radiation or if large, high cost increases in target hardness can be defeated by relatively small, low cost increases in laser power. Data on target vulnerability is extremely limited and a series of [ ] tests will be needed to generate a data base to input to system utility and cost effectiveness analyses conducted under Project 2148. Experiments and analyses must also be conducted to determine feasible target hardening techniques, and laser system responses to these countermeasures. In the FY 1982-84 timeframe, this is the number one priority task in the Space Laser Technology program.

Based on analyses and assumptions detailed in the "DoD Space Laser Program Plan", the Air Force is assuming that a [ ] will be required to satisfy multi-mission requirements. The Feasibility Technology task will identify and address key uncertainties associated with the technologies necessary to extrapolate DARPA TRIAD performance [ ] performance levels. In addition, significant improvements must be made in acquisition, tracking, pointing and support system performance. Hardware demonstrations will be limited to primarily subscale articles.

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: As with Project 2148, funding for this project was provided under PE 64406F, Space Defense Systems, in FY 1982. In July, 1982, funding was released to the Air Force and procurement activities were

Program Element: # 63603F Title: Space Laser Technology
DOD Mission Area: Directed Energy Technology, #554 Budget Activity: Advanced Technology Development, #2

initiated to support the studies and experiments to be conducted under this project. The Air Force Weapons Laboratory (AFWL) initiated plans for damage and vulnerability/hardening demonstations against projected targets. The AFWL started assembling a mid-power chemical laser device at the Sandia Optical Range, Kirtland AFB, for conducting vulnerability tests starting in FY 1983. The AFWL also assessed all past V&H work to provide a data base for the early Concept Definition and Utility Analyses efforts (see Project 2148). The AFWL began in-house and contractual efforts to resolve uncertainties in key technology areas supporting a[ ]

(2) FY 1983 Program: The Air Force Weapons Laboratory (AFWL), working with the Army and Navy, will accelerate efforts to determine system-level vulnerabilities of four major target types and physical threats to the space laser platform. Of primary importance is the determination of system-level vulnerabilities of and initial hardening concepts for Soviet liquid and solid propellant ICBMs and SLBMs, strategic aircraft, analysis of physical threats to the space-laser platform and the development of a validated predictive capability. The Laboratory will also continue technology development supporting a[ ]extrapolated from TRIAD technology. They will alter development, if necessary, to accommodate system requirements defined under Project 2148. The Program Office will continue examination of potential growth technology for shorter wavelength devices.

(3) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The AFWL will[ ] Through independent analysis, development of a predictive capability for vulnerability will continue. Testing designed to validate the vulnerability of these advanced concepts will be performed. Targets that threaten the laser platform and may be engaged by the laser as a means of self-defense will be evaluated. These targets will be identified through the survivability task and Red Team efforts in Project 2148.

In the Feasibility Technology area, the AFWL will focus its efforts on the most critical issues in achieving the performance goals for[ ] These efforts will include, but not be limited to, the[ ] the definition of the technology requirements and performance characteristics of a[ ]that can provide[ ]

Like Project 2148, this is a "level of effort" project in accordance with the May, 1981 commitment of the Deputy Secretary of Defense to Congress to increase DoD funding of space-laser R&D. Cost estimates were developed by the Air Force Systems Command and HQ USAF by first identifying the major areas of uncertainty associated with the target vulnerability, hardening, countermeasures and laser technology that must be addressed to support an informed decision on space-laser weapons and then estimating the minimum funding required to address these areas of uncertainty. The cost estimates contained in the June, 1982 "DoD Space Laser Program Plan" for this project were reexamined and certified in the Fall of 1982 following Congressional zeroing of the FY 1983 President's Budget Request for this program.

Program Element: # 63603 Title: Space Laser Technology
DoD Mission Area: Directed Energy Technology, 554 Budget Activity: Advanced Technology Development, #2

(4) Program to Completion: This project is scheduled to be complete by the end of [ ] The Air Force Weapons Laboratory will conduct damage and vulnerability demonstrations involving [ ] Nozzle efficiency measurements will be completed in [ ] The project will continue to input data to support a decision in the [ ] timeframe on whether to proceed to engineering development of a space-based laser weapon system demonstration.

C. (U) MAJOR MILESTONES:

		Date
(1)	(U) Mid-Power Laser Available at Sandia Optical Range	4QFY 1983
(2)	Booster Vulnerability Test	[ ]
(3)	Booster and Aircraft Hardness Tests	[ ]
(4)	Interim Decision	[ ]
(5)	Program Decision	[ ]

* Data presented in FY 1983 Descriptive Summary

(U) EXPLANATION OF MILESTONE CHANGES

(3) (U) Reflects impact of Congressional decision not to fund the FY 1983 President's Budget Request for this program.
(4) (U) Same as 3 above.

Program Element: #63605F Title: Advanced Radiation Technology
DOD Mission Area: #554 - Directed Energy Technology (ATD) Budget Activity: #2 - Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	75,516	87,466	82,530	74,548	Continuing	N/A

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This is the Air Force program for demonstrating the technical and engineering feasibility of using high energy lasers as directed energy weapons in USAF weapon systems. In general, the program includes broad-based technology development in all aspects of laser weaponry plus feasibility demonstrations of laser weapon technology. [ ]

3. COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	Additional to Completion	Total Estimated Cost
RDT&E	75,516	95,120	92,400	Continuing	N/A

Compared to the previous resources estimate, the current estimate reflects a Congressional reduction of $5 million in FY 1983, and an Air Force decision to decrease funding by $2.7 million in FY 1983 and $7.6 million in FY 1984 to support other Air Force programs. There was also a decrease of $2.3 million in FY 1984 due to a change in the inflation factors. These decreases have impacted the Mid Range Applied Technology thrust by delaying the [ ] technology demonstration [ ] In addition, the decreases have impacted the Airborne Laser Technology thrust by delaying and reducing the scope of critical technology investigations for intermediate range and short range airborne high energy laser systems. Major decisions on airborne high energy laser system development will be [ ]

4. (U) OTHER APPROPRIATION FUNDS: Not applicable.

5. (U) RELATED ACTIVITIES: This Program Element (PE) is part of a Department of Defense program which is coordinated by the Assistant for Directed Energy Weapons in the Office of Under Secretary of Defense for Research and Engineering and which includes work in: Defense Advanced Research Projects Agency PE 62301E, Strategic Technology, and PE 62711E, Experimental Evaluation of Major Innovative Technology; Army PE 62307A, Laser Weapon Technology; Navy PE 62735N, High Energy Technology, and PE 62768N, Directed Energy Technology; and Air Force PE 62601F, Project 3326, Laser Applications. Coordination occurs through annual apportionment reviews and quarterly High Energy Laser Review Group meetings attended

Program Element: #63605F   Title: Advanced Radiation Technology
DOD Mission Area: #554 - Directed Energy Technology (ATD)   Budget Activity: #2 - Advanced Technology Development

5. (U) RELATED ACTIVITIES: (Continued)

by the Army, Navy, Air Force, and DARPA program managers. Coordination with Department of Energy is effected by attendance at the Department of Energy laboratory technical program reviews, exchange of technical reports, and cooperative efforts at the working level.

6. (U) WORK PERFORMED BY: The Air Force Weapons Laboratory, Kirtland Air Force Base, NM, is responsible for managing this program. The top five contractors in FY 1982 were: Rockwell Rocketdyne, Canoga Park CA; Hughes Aircraft, Culver City CA; TRW, Redondo Beach CA; BDM, McLean VA; and General Dynamics, Fort Worth TX. In addition, there were 27 additional contractors with contracts totaling $50.2 million. In-house test facilities involved in this work include the Advanced Radiation Technology Facility at Kirtland Air Force Base NM.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable.

8. (U) PROJECT 317J, Advanced Radiation Technology (PROJECT OVER $10M IN FY 1984):

A. Project Description: This is a broad-based technology program to demonstrate the technical and engineering feasibility of using high energy lasers as directed energy weapons in Air Force strategic and tactical combat environments. The Air Force anticipates a continuing requirement to defend aerospace systems against attack. Previous extensive studies have indicated that a high energy laser weapon could be effective against targets such as air-to-air and surface-to-air missiles, ballistic missiles, aircraft, and spacecraft. Recent studies concluded that the potentially highest payoff applications include [ ] Successful operational laser weapon systems for these mission applications could have a major impact on the overall offensive and defensive strategies of US military forces. The Advanced Radiation Technology program includes four major areas of emphasis or thrusts: Airborne Laser Laboratory; Airborne Laser Technology; Mid Range Applied Technology; and Advanced Development/Support. Airborne Laser Laboratory thrust: The first technology demonstration of laser weapon effectiveness in an airborne environment will be accomplished by the Airborne Laser Laboratory. The Airborne Laser Laboratory includes a [ ] gasdynamic laser at 10.6 micrometers wavelength installed aboard a modified NKC-135 aircraft. The Airborne Laser Laboratory will demonstrate effectiveness at short range [ ] against drone and missile targets and will investigate critical technology issues for airborne high energy laser systems. Airborne Laser Laboratory flight testing will provide information on high energy laser phenomenology and effectiveness in a realistic environment which is essential for the development of airborne laser weapons. Airborne Laser Technology thrust: This thrust develops and demonstrates the feasibility of near-term high energy laser technology for airborne applications. At intermediate ranges [ ] laser systems operating at shorter wavelengths become more advantageous. However, greater pointing and tracking precision and improved mirror optical quality are required to take advantage of the shorter wavelength. The cylindrical deuterium fluoride chemical laser at about 4 micrometers wavelength shows promise of achieving efficient operation at the higher powers [ ] required for intermediate range missions. The subsystems technology for more precise pointing and tracking systems is also being pursued to meet the requirements for intermediate range beam control systems. Along with information from the Airborne Laser Laboratory flight testing, the technology being developed in this Airborne Laser Technology

Program Element: #63605F Title: Advanced Radiation Technology
DOD Mission Area: #554 - Directed Energy Technology (ATD) Budget Activity: #2 - Advanced Technology Development

8. (U) PROJECT 317J, Advanced Radiation Technology (PROJECT OVER $10M IN FY 1984): (Continued)

A. Project Description: (Continued)

thrust could support development of [ ] Mid Range Applied Technology thrust: [ ] An existing deuterium fluoride chemical laser and beam director telescope will be upgraded to provide the technology demonstration [.] Advanced Development/Support thrust: The technology required for long range [ ] applications is also being pursued, including shorter wavelength laser devices and advanced beam control systems with their more stringent performance requirements. In particular, this includes increasing emphasis on the technology for applications from space platforms. Finally, in order to define and evaluate Air Force applications, a program in system modeling and mission application studies, propagation, and laser effects and vulnerability of targets is being pursued.

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: Airborne Laser Laboratory thrust: The completion of single target tests was delayed [ ] because of the unforeseen requirement to completely refurbish all the cooled mirrors in the optical system. One cooled mirror failed in early FY 1982. Subsequent evaluation of the entire optical system indicated that internal mirror corrosion and degradation of mirror optical surfaces were significant enough to require refurbishment in order to ensure reliable system performance for planned flight testing. With this delay, FY 1982 accomplishments include the completion of analysis of system performance in prior ground and flight testing, the development of beam control system upgrades to improve system performance, the completion of the mirror refurbishment, and the start of the beam control system rebuild and characterization [The delays in FY 1982 will also delay the completion of the next phase of the Airborne Laser Laboratory flight test and demonstration series [ ] Recent Air Force mission applications analyses of airborne high energy laser weapons concluded that [ ] In response, the next phase of the Airborne Laser Laboratory technology test and demonstration program is structured to provide a technology and engineering data base to support these future applications. Airborne Laser Technology thrust: The testing and evaluation of the gain generator for the deuterium fluoride cylindrical chemical laser was delayed [ ] due to problems with thermal distortions of the gain generator nozzle hardware which were identified during initial testing. Accomplishments in FY 1982 include the completion and validation of stiffening modifications to the gain generator and the start of gain generator reassembly and checkout. The fabrication of the heat exchangers for the associated annular resonator mirrors was completed, and machining and polishing of the optical surfaces were begun. High quality optical coatings for this resonator were also demonstrated on subscale components. A breadboard system for the laboratory evaluation of advanced beam control concepts, including wavefront correction within the optical system, was fabricated and delivered, and efforts to define critical issues for shorter wavelength laser systems for both short and intermediate range airborne laser systems were completed. Technology

Program Element: #63605F Title: Advanced Radiation Technology
DOD Mission Area: #554 - Directed Energy Technology (ATD) Budget Activity: #2 - Advanced Technology Development

8. (U) PROJECT 317J, Advanced Radiation Technology (PROJECT OVER $10M IN FY 1984): (Continued)

B. (U) Program Accomplishments and Future Efforts: (Continued)

(1) FY 1982 Accomplishments: (Continued)

assessment and requirements studies for airborne laser weapons were begun. Mid Range Applied Technology thrust: All hardware components for the laser system were identified. Laser device, beam director, and facility upgrades were begun. System integration design and target availability studies were initiated. Advanced Development/Support thrust: The thermostructural analysis of the stiffened nozzle modification for the deuterium fluoride cylindrical chemical laser gain generator was completed. The acquisition and installation of a 150 kilowatt deuterium fluoride chemical laser for use in in-house laser effects and vulnerability testing were initiated. Development of an advanced diamond turning machine for optical surface finishing of high energy laser mirrors was completed, and ground vulnerability experiments on liquid fueled missile boosters were conducted.

(2) FY 1983 Program: Airborne Laser Laboratory thrust: After integration and ground checkout of the laser system aboard the Airborne Laser Laboratory aircraft have been completed, airborne high power tests against instrumented tow targets will provide the technology data base to validate performance predictions and laser beam control and propagation analysis techniques. [ ] Airborne Laser Technology thrust: Testing and performance evaluation of the deuterium fluoride cylindrical chemical laser gain generator will be completed. The associated annular resonator optics will be polished and optically coated in preparation for the high power tests[ ] Development and scaling of critical technology for the oxygen-iodine chemical laser will begin. Critical laser device and beam control technology investigations will continue and the conceptual design of the laser device and beam control system[ ]will be initiated. A major mission applications study and requirements analysis for the potential use of laser weapons in[ ]applications will be initiated. Mid Range Applied Technology thrust: [ ] Advanced Development/Support thrust: Development and expansion of the technology base for high energy lasers will continue, with emphasis on the development of improved optical components and the assessment of laser vulnerability. A[ ]deuterium fluoride chemical laser for use in in-house laser effects and vulnerability testing will be activated.

(3) FY 1984 Planned Program and Basis For FY 1984 RDT&E Request: Airborne Laser Laboratory thrust: Laser system upgrades will be completed and the next phase of airborne testing will begin, providing data obtainable only through airborne testing which is crucial to decisions for the future development of laser weapon systems. These flight tests and demonstrations will emphasize the experiments and test scenarios needed to provide key phenomenology and effectiveness data in the airborne environment. For efficient use of the Airborne Laser Laboratory platform, system modification and upgrades will be prepared in parallel with current flight testing to minimize downtime. Airborne Laser Technology thrust: The annular resonator and the alignment system will be integrated with the gain generator to form a [ ]deuterium fluoride cylindrical chemical laser. [ ]

Program Element: #63605F Title: Advanced Radiation Technology
DOD Mission Area: #554 - Directed Energy Technology (ATD) Budget Activity: #2 - Advanced Technology Development

B. (U) Program Accomplishments and Future Efforts: (Continued)

(3) FY 1984 Planned Program and Basis For FY 1984 RDT&E Request: (Continued)

[ ] The development and scaling of critical technology for the oxygen-iodine chemical laser will continue. Fabrication of a [ ] oxygen-iodine chemical laser device will be completed and integration will be started. Critical laser device and beam control technology investigation will continue and the preliminary design of laser device and beam control system [ ] will begin. These technology development and preliminary design efforts will provide the technology base, concept definition, and requirements analysis to support a decision [ ] Mid Range Applied Technology thrust: [ ] Advanced Development/Support thrust: Program support and development and expansion of the technology for high energy lasers will continue with increasing emphasis on short wavelength/long range concepts. Basis for Request: Cost estimates for this program element are derived using analogous contract manhour, material, and overhead charges adjusted for program complexity, risk, and inflation. This is an advanced development program with a reasonable data base for cost estimation.

(4) (U) Program To Completion: This is a continuing program.

C. (U) Major Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63704F
DOD Mission Area: #522 - Environmental and Life Sciences (ED)

Title: Manpower and Personnel Systems Technology
Budget Activity: #2 Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0	0	1,830	2,742	Continuing	N/A
2922	Personnel Assessment Systems	0	0	1,270	1,542	6,600	9,400
2948	Comprehensive Data Analysis Program (CODAP)	0	0	180	190	500	900
2949	Basic Skills Assessment	0	0	0	660	3,800	4,500
2951	Training Decisions System	0	0	380	350	900	1,600

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Air Force requires enhanced manpower and personnel management systems in order to effectively and efficiently provide a continuing supply of quality men and women to Air Force jobs. Complex force composition and training policy decisions require detailed information which can be provided by manpower and personnel systems technology. To optimally select and classify individuals, the Air Force and the Department of Defense must use validated tests. The Air Force is the executive agent for the continual development of multiple versions of the Armed Services Vocational Aptitude Battery (for enlisted members) and Air Force Officer Qualification Test (for officer personnel). This program is designed to provide the systems development technology necessary to satisfy DOD and Congressional requirements in personnel and selection testing. The development of accurate criterion measures to evaluate the performance of members in enlisted and civilian Air Force jobs must be accomplished to permit improved validation of test and training programs. Devlopment and validation of these methods will lead to more accurate selection and classification of individuals and ensure optimal match of individual aptitudes and job requirements. Additional efforts will advance the primary job analytic system in use by the Air Force, provide for improvements in training effectiveness and management, and provide models to use in manpower policy formulation and training systems evaluations. The projects in this program element are FY 1984 new starts and require this level of funding for project start-up.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: PE will be initiated in FY 1984. This is the initial descriptive summary.

4. (U) OTHER APPROPRIATION FUNDS: Not applicable.

Program Element: #63704F Title: Manpower and Personnel Systems Technology
DOD Mission Area: #522 - Environmental and Life Sciences (ED) Budget Activity: #2. Advanced technology Development

5. (U) RELATED ACTIVITIES: Related PEs are 62703F, Personnel Utilization Technology; 61102F, Defense Research Sciences; 62205F, Training and Simulation Technology; 62703F, Personnel Utilization Technology; 62717A, Human Performance Effectiveness and Simulation, 63731A Manpower & Personnel; 62763N, Personnel and Training Technology; and 63707N, Manpower Control System Development.

6. (U) WORK PERFORMED BY: The program element will be managed by the Air Force Human Resources Laboratory (AFHRL), Brooks AFB, Texas, through the Manpower and Personnel Division. Since this is an FY 1984 new start, no contracts have been let.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: 2922 - Personnel Assessment Systems. This project is classified in the manpower and personnel Congressional category. To meet advancing Air Force combat capabilities, readiness, and sustainability a constant input of capable manpower is needed. The technology to identify, select, train, and retrain individuals who are capable of mastering complex technical skills must be developed. This technology must include the development of new systems which would provide information currently unavailable on individual job performance. The technology to obtain task-level measures of on-the-job performance to be used to validate selection and classification measures, assess training outcomes and evaluate the effects of organizational and environmental factors, motivational factors, and personnel policies on job performance will be developed. A main effort will be the transitioning of job performance measurement research results into advanced development efforts. The job performance measures will be developed for enlisted members and civilians. Procedures will be provided to HQ USAF/MP for use by trained evaluators. It will be of a generic nature to foster use across Air Force specialties. When completed, this project will provide measures for validation of enlisted selection and promotion tests and will reduce the risk of civilian class-action suits against the government which could result in a cost avoidance of approximately $2.5 million per year. Replacement of service tests and test batteries is required to avoid obsolescence, guard against test compromise, and incorporate improvements identified in ongoing service test research programs. Additionally, the Armed Services Vocational Aptitude Battery (ASVAB) must serve needs of all services. Since the Air Force has been appointed the executive agent for ASVAB item development, the test needs frequent revision for protection against compromise and for incorporation of research findings. Cyclic production of operational test revisions (e.g., ASVAB and aircrew selection tests) and their validation against performance measures has been mandated by Congress. Development of a new set of comparable ASVAB batteries will be completed in FY 1984. They will be implemented for production testing on 1 October 1983, with a large-scale Initial Operational Test and Evaluation (IOT&E) in FY 1985. Cyclic production of another set of ASVAB batteries is starting now and will be in full progress during FY 1984. Another unique version of the ASVAB will be completed, along with associated materials, for placement in the services high school testing program in July 1984.

B. (U) Project: 2948 - Comprehensive Occupational Data Analysis Programs. This project is classified in the manpower and personnel Congressional category and is a new start in FY 1984. The currently operational Comprehensive Occupational Data Analysis Programs (CODAP) system is rapidly becoming antiquated and difficult to maintain, and an advanced development program is required to provide a top-down structured approach to system redesign and reprogramming to make it more efficient, easier to maintain, and more user-friendly. The original CODAP system has resulted in cost avoidance of over $3M per year since its implementation in FY 1968 and its redesign should make its utility more cost-effective. Redesign will begin in FY 1984. Other benefits include: (1) state-of-the-art analytical, statistical, and reporting procedures, (2) techniques for longitudinal analyses of job content, (3) techniques for developing more job-related promotion tests, and (4) techniques for matching weapon system acquisition tasks with related personnel skill requirements.

C. (U) Project: 2949 - Basic Skills Assessment and Enhancement System. This project is classified in the education and training Congressional category and is a new start in FY 1984. The project will provide a system to measure and train the basic functional skills (literacy, arithmetic computation, dial and map reading, etc.) required in Air Force enlisted specialties. Because basic skill requirements for Air Force occupational specialties have not been empirically derived and validated, there is no established relationship between reading ability and Air Force on-the-job performance. This suggests that better readers are not necessarily better performers, regardless of the job content. Moreover, there are no data to indicate what additional (or substitute) cognitive requirements may exist. Finally, the program evaluation routinely conducted for current reading enhancement programs is inadequate for purposes of attributing gains in reading grade level to such training programs. This project will: (1) validate basic cognitive occupational requirements against job performance measures, (2) develop and validate cognitive ability measures specific to identified occupational requirements, (3) design and develop training packages including program evaluation components to remediate job-specific personnel literacy deficiencies, and (4) a basic skills technology management information system for tracking and managing the system across all occupational specialties in the Air Force. Initial building of instructional models for identified job prerequisites will begin in FY 1984. Upon completion, this project should reduce marginal performers by 50 percent, reduce overall on-the-job training time, result in increasing numbers of career airmen, and provide airmen with the skills necessary to perform well on the job immediately after arrival. Savings from reduced attrition could reach as much as $10 million per year and savings from increased productivity will approximate $5 million per year. By replacing currently ineffective and non-job-related basic skills enhancement programs with a generic basic skills enhancement program, the Air Force could realize $20 million per year in cost avoidance.

D. (U) Project: 2951 - Training Decisions System. This project is classified in the education and training Congressional category and is a new start in FY 1984. Because of the scope of Air Force technical training, many decisions with major impacts on training are made, to some extent independently and at different times, by management units responsible for different parts of the training and personnel systems. Coordinating such efforts is complex, and relevant data are not always available at key decision points when they are needed. For example, the content of resident technical school training is largely determined by predefined budgets, and whatever content is not covered in the school is left to on-the-job training (OJT), without systematic appraisal of long-term costs or OJT capacities. Current practice does not include adequate consideration of all relevant factors, such as costs and alternative patterns of personnel utilization, in making basic decisions regarding the what, where, and when of technical training. A need exists for a more unified, practical, and integrated approach to such problems with all relevant data considered at once for certain basic decisions. In FY 1984, data collection procedures will be established and data collection will begin. Other future milestones include the transfer of computer technology, field tests and system refinements with applications in four Air Force specialties, and definition of manning, resources, and pipeline schedules needed for

Program Element: #63704F
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sustained operations. Benefits from this project include reduced training costs, improved allocations of training content and resources, and demonstrably better alignment of training content with job task requirements. When operational, projected total savings plus cost avoidance are on the order of $50 million per year, at a minimum. Initial significant savings are projected by mid-FY 1986.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63723F
DOD Mission Area: #553, Engineering Technology (ATD)

Title: Civil and Environmental Engineering Technology
Budget Activity: #2, Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	3,885	4,102	5,007	4,257	Continuing	N/A
2103	Environmental Quality Technology	700	800	900	900		
2104	Civil Engineering Technology	3,018	2,902	3,700	2,957		
2672	Special Terrestrial Power	167	400	407	400		

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Provides technology base to enhance force readiness and improve sortie generation capability. This goal is achieved by efforts to: develop an improved Post Attack Launch and Recovery capability; provide technology for more effective tactical deployment, air mobility, and survivable airbase structures; optimize airfield surfaces maintenance, repair, and new construction techniques; develop more effective fire fighting agents, equipment, and vehicles; provide technology for characterization, control, and disposal of Air Force unique pollutants such that Federal, Department of Defense, and local environment regulations are met; and adapt Department of Energy and other agencies' technology to enhance the survivability and reduce the vulnerability and petroleum-fuel dependence of mission essential energy systems.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY ($ in thousands):

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	3,885	4,502	5,163		Continuing	N/A

4. (U) OTHER APPROPRIATION FUNDS ($ in thousands): Not Applicable.

5. (U) RELATED ACTIVITIES: The efforts within this program are of significant interest to the other services and are specifically coordinated through the Joint Services Civil Engineering Research and Development Coordinating Group, which is responsive to the Department of Defense. This group ensures efforts are not duplicated across the services and that maximum technology transfer is obtained. In addition, the group has an airbase survivability panel which reviews Post Attack Launch and Recovery efforts. All Air Force efforts in environmental quality R&D are covered in Department of Defense Area Coordinating Paper 42, which is specifically designed to prevent duplication within the military services and between the services and other agencies. Efforts of civilian or national interest are coordinated as appropriate with the Federal Aviation Agency, National Aeronautics and Space Administration, Environmental Protection Agency, and Department of Energy; and joint programs have been established with those agencies. This program directly funds related engineering development projects that transition into Program Element 64708F, Other Operational Equipment. Additionally, Program Element 62601F, Advanced Weapons, funds exploratory development in environmental quality and civil engineering technology, and Program Element 62203F, Aerospace Propulsion, directly funds exploratory development in power generation and energy conversion technology.

Program Element: #63723F Title: Civil and Environmental Engineering Technology
DOD Mission Area: #553, Engineering Technology (ATD) Budget Activity: #2, Advanced Technology Development

6. (U) WORK PERFORMED BY: In-house efforts are conducted by the Engineering and Services Laboratory, Air Force Engineering and Services Center, Tyndall Air Force Base, FL, and by the Aero Propulsion Laboratory, Wright Patterson AFB, OH. These laboratory facilities provide the capability for: subscale and limited full-scale protective construction and pavement weapons effects testing, design and testing of airfield pavement materials and construction techniques, computer facility and utility design analysis, environmental chemistry research, and test and evaluation of power generation and energy conversion technology. The top five contractors and associated projects are BDM, McLean, VA; New Mexico Engineering Research Institute, Albuquerque, NM; General Dynamics, Fort Worth, TX; Lincoln Laboratory, Lexington, MA; and Wilson Hill, Washington, DC. The total number of contractors is 18 with a total contract dollar value of $3,000,000 in FY 1984.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project 2103, Environmental Quality: Develops the technology to solve Air Force unique and time critical problems in environmental quality. This project has helped prevent costly litigation and encroachment of Air Force facilities. Accomplishments during FY 1982 include development of a refrigeration system at March AFB that demonstrated 90 percent recovery efficiency in trapping JP-4 vapor emissions from storage tanks. Also developed was a prototype packed tower air stripper system to remove trichloroethylene from groundwater at Wurtsmith AFB. The air stripper could possibly save $400K per year for the next 30 years over the carbon removal system now being used at Wurtsmith AFB. Developed during FY 1983 will be an automated computer system for real-time response to chemical and hazardous liquid propellant accidents. Ongoing development efforts will include a laser remote sensing device to map atmospheric pollutants, a single state-of-the-art air quality dispersion model, and a three-dimensional groundwater model. Development efforts for FY 1984 will include continuation of the laser remote sensing device and groundwater model along with investigation of water and wastewater treatment techniques for mobility. Also to be developed are recovery and dispersion techniques for toxic materials, a dispersion model for low-level flights and methodologies for pilot sludge reduction.

B. Project 2104, Civil Engineering Technology: Provides technology for survivable airbase structures, assurance of sortie generation, and reduction of airfield maintenance and repair costs. The bulk of this project is devoted to the Rapid Runway Repair (RRR) program. During FY 1982, the computer simulation models for the F-111 and C-5 were completed under the RRR program. These models are used to determine allowable runway surface roughness and minimum operating strip selection criteria. Completed also under RRR were a small-scale foreign object damage prediction study and a concrete polymer materials study which reduced candidate advanced repair materials to two. Development of a lower-cost barrier cable impact pad for use under aircraft arresting systems was successfully completed. The new repair method is one-third the cost of the old method and requires runway shutdown of 6 hours versus 3 days for the old method. For FY 1983, the RRR program will continue development of advanced crater repair materials and techniques and investigation of foreign object damage mechanisms. Alternate surfaces conceptual designs will be evaluated and a specific design will be tested. Efforts will be initiated to make existing pavements more damage resistant and to investigate portable taxiway systems. Related to airbase survivability in general will be efforts on antipenetration techniques and functional area damage assessment. The antipenetration effort will develop design parameters for rock rubble and burster slab hardening techniques which can resist penetrating weapons. The functional area damage assessment effort will develop

Program Element: #63723F
DOD Mission Area: #553, Engineering Technology (ATD)

Title: Civil and Environmental Engineering Technology
Budget Activity: #2, Advanced Technology Development

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: (Continued)

B. Project 2104, Civil Engineering Teechnology: (Continued)

an analysis tool to determine the weak points of specific facilities along with computing an overall airbase sortie generation rate for a specific attack scenario. Another non-RRR effort is development of pavement recycling techniques for airfield runways. Successful development of such techniques could cut by 30 to 50 percent the projected $2.5 billion for runway pavement repair and maintenance cost over the next decade. The bulk of the FY 1984 program will continue to emphasize technology development for RRR in the areas of bomb damage repair, alternate launch and recovery surfaces and aircraft response to runway surface roughness. Outside of the RRR efforts, the antipenetration systems study will be completed and development of a functional area survivability assessment tool and runway pavement recycling techniques will continue. The asphalt fatigue study will be completed. FY 1984 will mark initial technology development efforts in fire technology, which will begin with the development of a multidimensional fire fighting agent and an advanced fire fighting vehicle that can traverse all types of terrain.

C. Project 2672, Special Terrestrial Power: Adapts Department of Energy and other agencies fuel cell and advanced heat engine technology to meet Air Force remote, auxiliary, unattended, and special power system needs. Fuel cells and heat engines use half the fuel of conventional diesel and gasoline generators, however, the technology needs to be advanced in order to meet Air Force unique requirements. The project was started in FY 1981 and during FY 1982, equipment was purchased to begin adaptation of the 5 and 40 kW fuel cells for Air Force use. During FY 1983, adaptation of the 5 and 40 kW fuel cells for remote site applications will continue. To satisfy Tactical Air Forces' need for tactical power sources, development of a 3 kW Stirling engine will continue in FY 1983 and FY 1984. In FY 1984, the 5 and 40 kW, 40 percent efficient, fuel cell power systems will be evaluated under operational conditions.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63728F — Title: Advanced Computer Technology
DOD Mission Area: #551, Electronics and Physical Sciences, (ATD) — Budget Activity: #2, Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	4,582	3,457	6,892	6,688	Continuing	N/A
2527	Software Life Cycle Tools	0	347	700	1,243	Continuing	N/A
2528	Software Data Collection and Analysis	520	0	0	0	0	1998
2529	Computer Architecture Applications	600	600	800	900	Continuing	N/A
2530	Distributed System Technology	1,782	1,260	2,621	3,045	Continuing	N/A
2531	Software Engineering Tools and Methods	630	0	0	0	0	3816
2532	High Order Language Discipline	1,050	1,250	2,771	1,500	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program develops and demonstrates technologies to reduce the mushrooming costs of developing and modifying military computer software. Thrusts include automating the software development process, introducing a prudent amount of standardization into the process, and providing management tools to control the process. This program is also responsive to the fact that weapons system complexity and the availability of low cost microprocessors are driving military embedded computer systems toward the concept of distributed data processing. Our objective is to exploit advances in distributed processing technology and develop techniques to satisfy critical military requirements such as fault tolerance, reliability, and survivability in the battlefield environment.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	4,782	4,957	5,816	N/A	Continuing	N/A

A. (U) FY 1982, -$200K. Difference reflects a $240K reduction in Project 2530, Distributed System Technology, and a $40K addition in Project 2532, Higher Order Language Discipline.

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B. (U) FY 1983, -$1500K. Difference is the result of a Congressional reduction to preclude starts involving the MIL-STD-1750A Instruction Set Architecture (ISA). The 63728F FY 1983 request, however, contained no funds for the 1750 ISA. Therefore, the reduction was distributed as follows:

1. Project 2527: -$353K. Delays all FY 1983 new starts, specifically in the software quality and testing areas.

2. Project 2529: +$100K. Continues the FY 1982 initiated Nebula Brassboard effort which was negotiated at a higher cost than estimated.

3. Project 2530: -$940K. Delays all FY 1983 new starts and delays completion of two efforts to develop and demonstrate methods of fault sensing and automatic recovery in embedded computer systems.

4. Project 2532: -$307K. Stretches development of the Ada Integrated Environment effort.

C. (U) FY 1984, +$1076K. Distributed as follows:

1. Project 2530: -195K. New starts will start later in FY 1984.

2. Project 2532: +1271K. Difference is the result of a higher than estimated cost for the Ada Integrated Environment (AIE) effort in Project 2532. It will also provide $307K for AIE work deferred from FY 1983.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands): Not Applicable

5. (U) RELATED ACTIVITIES: This program supports and is responsive to the DOD Defense Computer Resources Technology Plan and the DOD sponsored Software Technology Initiative. It is related to other programs which constitute the DOD Software Science and Technology Program: 62725A, Computer and Information Sciences; 63723A, Tactical Automation; 62721N, Command and Control Technology; 63526N, Advanced Computer Technology; 64574N, Tactical Embedded Computer Program; 62708E, Distributed Information Systems; 62204F, Aerospace Avionics; 62702F, Command, Control and Communications; 63226F, DOD Common Programming Language; and 64740F, Computer Resources Management Technology. Air Force thrusts generally transition into this program from 62702F and are coordinated through technical reviews at the staff and engineering levels. Coordination with other services is achieved through the Research and Development Technology Panel of the Management Steering Committee for Embedded Computer Resources, annual DOD apportionment reviews and the Ada Joint Program Office.

6. (U) WORK PERFORMED BY: The Rome Air Development Center, Griffiss AFB NY, has management responsibility for this program. The top five contractors are: Intermetrics, Cambridge MA; Bolt, Baranek and Newman, Cambridge MA; Honeywell, Minneapolis MN; Control Data Corporation, Minneapolis MN; and System Development Corporation, Santa Monica CA. In addition, there are/will be six additional contractors for a FY 1984 total funding of $2,000K.

Program Element: #63728F
DOD Mission Area: #551, Electronics and Physical Sciences, (ATD)

Title: Advanced Computer Technology
Budget Activity: #2, Advanced Technology Development

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project 2527, Software Life Cycle Tools. The objective of this project is to develop and demonstrate software engineering technology in the areas of requirements, design, development and maintenance, and to transfer developed products into the Air Force acquisition environment. This project appears to be new in FY 1983 but is really a consolidation of two 63728F projects (2528 and 2531) that conclude in FY 1982. In FY 1982, the Data Analysis Center for Software (DACS) was completed and made operational as a DOD Information Analysis Center; National Software Works enhancements required to support a joint AFSC/AFLC demonstration were completed; development of a handbook for software testing was continued (FY 1983 completion); and development of a software quality requirements guidebook was continued (FY 1984 completion). In FY 1984, efforts will be initiated to automate the retesting of software during the operations and support phases of the software development cycle; develop an integrated environment to support AF C^3I systems; automate software tools specific to building and maintaining distributed systems; and enhance and apply software quality measurement tools to C^3I systems.

B. (U) Project 2529, Computer Architecture Applications. The objective of Project 2529 is to evaluate standardized commercial and DOD developed computer architectures to determine their applicability and efficiency in Air Force Command, Control, Communications and Intelligence (C^3I) applications. Results of these evaluations are documented in technical reports and in Air Force and Air Force Systems Command regulations. In FY 1982 this project commenced development of a brassboard model of a Nebula architecture machine for evaluation in the context of AF C^3I applications (FY 1984 completion). In FY 1984, Nebula architecture modifications required to support AF C^3I applications will be identified to the Army for incorporation into future revisions of MIL-STD-1862A, Nebula. In FY 1984, this project will commence the Nebula Validation effort to develop a system to validate and monitor the performance of the Nebula architecture with respect to AF C^3I applications; and commence an effort to interface MIL-STD-1862A (Nebula) hardware to a common communications link such as the flexible intraconnect to support the sharing of data and resources in multi-hardware processing enviroments.

C. (U) Project 2530, Distributed System Technology. The objective of Project 2530 is to develop the programming and support tools, techniques, and simulation capabilities to evaluate distributed computer processing and operating systems/schemes. Emphasis will be placed on tactical Air Force C^3I applications. In FY 1982, this project continued development of a prototype distributed operating system which will be completed in FY 1983. In FY 1984 efforts will be initiated to develop, evaluate and document techniques to improve fault sensing, resource sharing and automatic reconfiguration in strategic and tactical distributed data processing systems.

Program Element: #63728F
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Title: Advanced Computer Technology
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D. (U) Project 2532, High Order Language Discipline. Even though Ada will become the standard DOD higher order language in the near future, software developers can only develop, implement, test, and support Ada if they have the proper working tools (linkers, loaders, compilers, debuggers, etc.) called the Minimal Ada Programming Support Environment (MAPSE). This project develops and provides the software development community with these required tools for various different Air Force used computer systems. In this way it implements the Air Force's approved Ada Implementation Plan. In FY 1982, the design for the Ada Integrated Environment (AIE) was completed and the development of the AIE initiated. This effort will produce in FY 1984, a working, IBM 370 compatible, Ada compiler, debugger, program support library and editor. Also in FY 1982, a RADC inhouse effort was initiated to evaluate commercially available Ada Environments that are hosted on, or targeted for, microprocessor systems. This effort will conclude in FY 1984 and along with the experience gained from the AIE effort, form the basis for an FY 84 initiation of an effort to rehost and retarget the IBM 370 Ada compiler and support environment to other computer systems commonly used in the Air Force.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63743F   Title: Electro-Optical Warfare

DOD Mission Area: 551 - Electronic & Physical Sciences (ATD)   Budget Activity: 2 - Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	9,761	14,000	20,714	20,299	Continuing	Not Applicable
431G	Electro-Optical Warfare	7,761	9,150	12,014	13,000	Continuing	Not Applicable
2222	Advanced Electro-Optical Countermeasures	2,000	4,850	8,700	7,299	Continuing	Not Applicable

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides advanced development, risk reduction and feasibility/military worth demonstration of countermeasures against visually, electro-optically, infrared aimed or guided, or laser-aided surface-to-air and air-to-air weapons. Current Soviet antiaircraft artillery (AAA) and radar directed surface-to-air missile (SAM) systems use some form of optics as a backup to the radar. In addition, shoulder fired SAMs and air launched missiles have been developed to home on engine radiation. Strategic, tactical, and airlift aircraft that operate over or near hostile territory may be exposed to these weapons. Currently, the only

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	10,261	15,927	22,636	Continuing	Not Applicable

(U) The decrease in funding in FY 82 reflects reprogramming of funds out of the PE to fund another higher priority program. The decrease in funding in FY 83 reflects a congressionally directed reduction with no rationale provided. The decrease in funding in FY 84 is the net result of a share of congressionally directed undistributed reductions, inflation adjustments, and a reprogramming of funds out of the PE to fund another higher priority program.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

5. RELATED ACTIVITIES: The efforts in this program are closely coordinated with Program Element (PE) 63718F, Electronic Warfare Technology and other Air Force electro-optical, electronic warfare, and reconnaissance and target acquisition programs, as well as the advanced development work in similar areas by the Army and the Navy through joint reviews conducted by the Joint Technical Coordinating Group. Maximum utilization of common optical hardware and techniques is stressed; equipment developed under other programs is modified only enough to perform those functions peculiar to the

countermeasures problem. New developments are undertaken only when the technology base does not exist to satisfy the specific function required. Exploratory development efforts are phased into this program from Program Element 62204F, Aerospace Avionics. Completed electro-optical efforts are transitioned into engineering development under PE 64710F, Reconnaissance Equipment; PE 64738F, Protective Systems; and PE 64739F, Tactical Protective Systems. Joint Air Force/Navy efforts include the Advanced Electro-Optical Countermeasure Pod; a low cost tail warning receiver development; and aircraft infrared signature reduction. Joint Air Force/Army efforts include [ ] and visual countermeasures effects and an infrared [ ] The F-15 contrast reduction effort is jointly sponsored with DARPA.

6. (U) WORK PERFORMED BY: Testing is performed at the Air Force Armament Division, Eglin AFB, FL and at the Naval Weapons Center, China Lake, CA. The Air Force Avionics Laboratory, Wright-Patterson AFB, OH, manages the program. The major contractors are: Quest Research Corporation, Washington, D.C. (431G); Honeywell Inc., Lexington, MA (431G); General Electric Corporation, Orlando, FL, (2222); and Westinghouse Corporation, Baltimore,MD (2222). There are 19 additional contractors with a total contract dollar value of $15,075 thousand.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: 2222, Advanced Electro-Optical Countermeasures (EOCM)

The primary purpose of this project is to demonstrate a system capable of locating optically or electro-optically (EO) directed surface-to-air threats; [ ] at the threat; and [ ] to degrade or damage the threat's capability to track. In addition, an air-to-air optical countermeasures system and a coordinated EO/Radio Frequency countermeasures capability will be developed and demonstrated. Virtually all Soviet and other Communist Bloc antiaircraft guns and surface-to-air missiles use some form of [ ] tracking. The U.S. has no countermeasure capability against any of these optical systems. This project is a technology base effort to develop electro-optical countermeasure systems. User requirements are documented in TAC ROCs 20-68, 312-80, and SAC ROC 4-76. The COMPASS HAMMER EOCM pod was successfully flight tested in FY 82 and initial data reduction and analysis conducted. Additional testing will be conducted and completed in FY 83. In FY 83, a demonstration effort of a [ ] to counter projected EO threats will be conducted. In addition, Project 2222 will complete design studies for CORONET PRINCE optical threat acquisition and cuing system; continue risk reduction for [ ] demonstrate [ ] breadboards; and flight test combined EO/RF countermeasures techniques. In FY 84, continued improvements are planned for Advanced EOCM systems. These include [ ] more [ ] and reliability and maintainability improvements, all of which are necessary to demonstrate practical supportable systems compatible with tactical aircraft. The CORONET PRINCE weapon delivery development study will conclude its effort to transition demonstrated technology to engineering development. Brassboard development for an air-to-air optical countermeasure system will be initiated.

Program Element: 63743F Title: Electro-Optical Warfare
DOD Mission Area: 551 - Electronic & Physical Sciences (ATD) Budget Acitivity: 2 - Advanced Technology Development

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: 431G, Electro-Optical Warfare

A. Project Description: The purpose of Project 431G is to demonstrate advanced development countermeasures to enemy air defense guidance systems which operate in the optical spectrum[ ] Examples of such systems are IR heat seeking missiles which home in on aircraft jet engines and television cameras which can track airborne targets and provide guidance to enemy antiaircraft guns or surface-to-air missiles. Improvements in these systems and development of new weapons using[ ]parts of the optical spectrum require continuing development to gain and maintain an advantage over the threat. The enemy air defense network is made up of electronic and electro-optical devices that locate, monitor, guide, and control the offensive and defensive elements. Denial of enemy use of these elements is directly related to the survivability of our aircrews and the number of weapons delivered to the target. Initially, enemy air defense systems operated only in the communications and radar frequencies (approximately 20 megahertz to 18 gigahertz). However, as weapon systems became more sophisticated, enemy threat systems began using optical and infrared (IR) types of devices as a complementary means to enhance their capability. Efforts in Project 431G include a supporting simulation and analysis effort that guides the allocation of funding through the evaluation of new concepts and techniques, camouflage to prevent or delay detection of US Air Force aircraft, receiver systems aircraft to warn crew members and activate countermeasures, and decoys and jammers to counter enemy air defense weapons. This project is a technology base effort which supports TAC SONs 20-68, 312-75, 304-80, 312-80, and SAC ROC 4-76.

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: Accomplishments include the fabrication and bench testing an advanced development model of a Dual Mode (infrared and pulsed doppler radar) Tail Warning system (with expansion to forward warning) for[ ]aircraft. A warning system for the Detection of Laser Emitters (DOLE) was built and flight tested. A[ ]flare was developed, designed, and tested for the[ ]aircraft. A planned new start to demonstrate the improvement in reliability for flare decoy dispensers was cancelled and a program to develop a system to reduce the visual contrast of the engine inlet ducts on the F-15 was slipped one year due to a FY 82 $500 thousand reduction. No improvement in the reliability of flare dispensers for tactical aircraft will be realized and the technology to reduce the visual signature of the F-15 will be slipped by at least one year.

(2) FY 1983 Program: Flight tests for the Dual Mode Tail Warning System will be conducted and completed The low drag optical window program will be completed. Scheduled for completion is the development and testing of a [ ]flare for the[ ] Tests will be conducted at White Sands Missile Range. A laser warning receiver, angle-of-arrival receiver and a millimeter wave receiver will be integrated in the Detection of Laser, Radar, and Millimeter Waves (DOLRAM) program and flight tested. An Expendable Laser Jammer (ELJ) operating at a[ ]frequency will be completed and laboratory tested in preparation for an FY 84 flight test. Work will continue in the Infrared Search and Track (IRST) and Forward Looking IR Sets and IR Seeking Missiles Jammer programs; the Advanced Laser Warning System, which will provide a complete spectral coverage in the optical spectrum, and the F-15 signature reduction program. In addition, work will continue in the[ ]ELJ program. Planned new starts include an effort to develop an advanced[ ]an effort to develop a[ ]and an effort to develop a[ ]

Program Element: 63743F Title: Electro-Optical Warfare
DOD Mission Area: 551 - Electronic & Physical Sciences (ATD) Budget Activity: 2 - Advanced Technology Development

(3) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The flight testing of the [ ] flare is scheduled for completion. The fabrication of [ ] Expendable Laser Jammer will be completed and prepared for flight testing in FY 85. The [ ] ELJ will be flight tested and prepared for transition to engineering development. The F-15 visual signature program will be completed. Work will con 'nue on the Advanced IRCM program and the Advanced Laser Warning System. In addition, several analysis efforts will be conducted. A 30-month new start is planned to develop a [ ] flare. A 28 month new start will be conducted to develop [ ] that will reduce the vulnerability to enemy detection of our optical weapons delivery systems. A 24 month new start is planned to develop [ ] that will use expendable materials to decoy [ ] missiles. The programs scheduled for completion or planned for continuation will require approximately $12.8 million. Approximately $600 thousand will be available for the new starts. Estimates for the new starts are based on industry feedback and engineering experience.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63745F
DOD Mission Area: #522 Environmental and Life Sciences

Title: Chemical Warfare Defense
Budget Activity: #2 Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	3,985	4,877	4,576	4,435	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program is designed to alleviate Air Force unique operational and medical problems associated with chemical warfare operations. The program will demonstrate improved technology solutions to enhance Air Force capabilities to sustain mission essential operations and handle casualties in a chemical warfare environment. This includes development of equipment and operational procedures for crew protection, with emphasis on tactical air operations, personal decontamination, and casualty handling. The program will be performed by the Aerospace Medical Division, Brooks AFB, TX, which includes the Air Force School of Aerospace Medicine, Brooks AFB, TX and the Air Force Aerospace Medical Research Laboratory, Wright-Patterson AFB OH.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

3,985	4,877	4,687

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

5. (U) RELATED ACTIVITIES: The Air Force Chemical Warfare Defense program is formally coordinated with the other services. The Army is recognized as the Department of Defense lead agency for overall chemical warfare defense. Only efforts that have specific Air Force relevance or can be accomplished by the Air Force's technical expertise more economically will be addressed in this program. Areas that have multiservice interests and are not unique to the Air Force are identified to the Army for inclusion in their overall chemical warfare defense research program. The program is also coordinated on an international basis through the Air Standardization Coordinating Committee. In addition, bilateral efforts have been established with the United Kingdom Institutes of Aviation Medicine and the Chemical Defense Establishment. Liaison is maintained with Air Force operational commands.

6. (U) WORK PERFORMED BY: The Chemical Warfare Defense Research and Development Program is conducted by the Aerospace Medical Division with assistance of its two laboratories, the United States Air Force School of Aerospace Medicine, Brooks AFB TX, and the Air Force Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH. The contract portion of the program is being conducted by Mine Safety Applicances, Evans City PA, Puritan Bennett AERO Systems Company, Tenexe KA,

6. (U) WORK PERFORMED BY: (continued)

Burnswick Corporation, Williard OH, Scott Aviation-Sierra Products, Inc., Monrovia CA, and Battelle Labs, Columbus OH. The in-house portion of the program is centered on unique, complex, man-rated experimental facilities which are generally not available in the aerospace industry or academic institutions.

7. (U) PE Name (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984): Chemical Warfare Defense

A. (U) Project Description: The most serious near-term aspect of the United States posture is the state of the defensive capability against chemical warfare and the ability for our forces to continue to operate in a chemical warfare environment. In coordination with the Army, Department of Defense lead agency for overall chemical warfare defense, this advanced development program was initiated in FY 1982. Chemical Defense Biotechnology has been divided into four key areas associated with Air Force unique chemical defense problems: personal protective equipment, airbase operations, medical operations and equipment and crew performance. In the solution of these problems, we intend to develop improved aircrew filter systems and protective equipment compatible with current aircraft design; develop service life indicators of cockpit air filters and crew member protective clothing; develop specific medical and air evacuation support equipment such as vital signs indicators, multipatient respiratory support equipment, and decontamination apparatus. Absolute efficiency will be necessary to transport, decontaminate, and stabilize even the moderately injured or chemically intoxicated. We, therefore, intend to develop a complete and highly mobile medical echelon system, including integrated transportation, decontamination and treatment equipment, and a supportive technology for medical care and casualty flow in a chemical warfare environment.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The FY 1982 program includes efforts in air base modelling in a chemical environment, personal surface contamination monitor for fixed facilities, advanced chemical defense aircrew respirator, a vital signs monitor, and a jointly funded multipatient respiratory ventilator task with the Army.

(2) (U) FY 1983 Program: The FY 1983 program will continue those tasks initiated in FY 1982 and initiate efforts in aircrew combat spectacles and contact lens, piezoelectric detector transitioned from exploratory development, a quantitative fit test apparatus with support from the Army, and four echelon medical treatment systems analysis.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The FY 1984 program will address new initiatives in casualty transportation, chemical agent dosimeters, filter life indicators, and the transition of resin polymers for detection and identification from exploratory development. These efforts are necessary to satisfy the Air Force unique requirements of TAF SON 310-81 and MAC SON 5-82. The resources of the Aerospace Medical Division and its two laboratories, the United States Air Force School of Aerospace Medicine and the Air Force Aerospace Medical Research Laboratory will continue to perform in-house efforts supplemented by a contract portion of the program. Approximately 2 years are required to transition each of the new FY 1984 tasks into 6.4 Full Scale Engineering Development.

Program Element: #63745F
DOD Mission Area: #522 Environmental and Life Sciences

Title: Chemical Warfare Defense
Budget Activity: #2 Advanced Technology Development

7. (U) PE Name (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984): Chemical Warfare Defense (continued)

B. (U) Program Accomplishments and Future Efforts: (continued)

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones:

Milestones	Dates
P.E. Initiated	FY 1982
Breadboard Adv Aircrew Mask	FY 1983
Piezoelectric Detector Transitioned from 6.2	FY 1983
Resin Polymers Transitioned from 6.2	FY 1984
Personal Surface Contamination Monitor Transitioned to 6.4	FY 1984

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable.

Program Element: #63750F Title: Counter-Countermeasures (CCM) Advanced Development
DOD Mission Area: Electronic & Physical Sciences (ATD), #551 Budget Activity: Advanced Technology Development, #2

1. (U) RESOURCES (PROJECT LISTING)($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	2,038	5,541	10,559	11,771	Continuing	Not Applicable
2333	Ground Radar Electronic Counter-Countermeasures	885	1,200	3,800	4,100	Continuing	Not Applicable
2334	Airborne Radar Electronic Counter-Countermeasures	760	2,200	2,159	3,200	Continuing	Not Applicable
2335	Communication & Navigation Electronic Counter-Countermeasures	300	1,841	2,900	2,900	Continuing	Not Applicable
2347	Optical Counter-Countermeasures	93	300	1,700	1,571	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This technology base program element is the only Air Force advanced development program element for generic counter-countermeasures for ground radar, very high frequency and high frequency communications, airborne radar and electro-optical weapons and sensors. Individual Air Force programs are responsible for developing counter-countermeasures into their systems; however, this technology base program element is vitally needed to assist these programs in providing generic counter-countermeasures that can be incorporated into both developmental and fielded systems. Technologies developed under this program feed directly to fielded systems and also establish a data base for future systems.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	RDT&E	1,893	7,041	11,425		Continuing	Not Applicable

FY 83 was decreased for higher priorities within the budget.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable

Program Element: #63750F
DOD Mission Area: Electronic & Physical Sciences (ATD), #551

Title: Counter-Countermeasures (CCM) Advanced Development
Budget Activity: Advanced Technology Developments #2

5. (U) RELATED ACTIVITIES: This program will affect strategic offense and defense and general purpose force activities, and responds to a wide range of requirements. Technical coordination will be effected with laboratories and commands of the other services, as well as in-house Air Force technical agencies and facilities and the operational commands. PE 64201F, Aircraft Avionics Equipment Development, is developing advanced software for aircraft radars with programmable signal processors (e.g., F-15). PE 63750F, Project 2334 is feeding that effort.

6. (U) WORKED/PERFORMED BY: Rome Air Development Center, Rome NY has program management responsibility and project responsibility for ground radar and communication/navigation CCM; the Air Force Avionics Laboratory, Wright-Patterson AFB, OH has project responsibility for airborne radar CCM and optical CCM. Specific tasks will be performed by Air Force computer simulation facilities or other agencies possessing necessary expertise or resources. Some tasks will be performed under contract. The low cost decoy effort is on contract to Brunswick Corp., Costa Mesa, CA; the Tropo Communication Antenna and Processor is on contract to CNR Incorporated, Needham, MA. The very low frequency antenna receive system is on contract to AIL division of Eaton Corp., Arlington, VA; and the Air-to-Air Radar Baseline Technology contract is with Hughes Aircraft Corp., Los Angeles, CA. Optical CCM contracts are to Mead Technology Laboratories Dayton, OH; Science Applications Corp., La Jolla, CA; Hughes Aircraft, Culver City, CA; Honeywell Corp., Boston, MA; and Systems Research Laboratory, Dayton, OH.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project 2333, Tactical Radar ECM:

(U) FY 83: Complete testing of the low cost Anti-Radiation Missile decoy. Continue development of the main beam noise canceller. Initiate development of passive correlation techniques for improved electronic counter-countermeasures. FY 84: Complete the development of the main beam noise canceller nulling technique for use in the Advanced Tactical Radar (ATR). Initiate the development of an active aperture, agile beam airborne radar to meet the surveillance requirements posed by the target and Electronic Countermeasures (ECM) environment projected for mid 1990 threats. Initiate the development of technology to counter missile weapon systems that are designed to destroy advanced radar systems by using the discriminants of the radar. Transition the low cost Anti-Radiation Missile (ARM) decoy to the ATR for Full Scale Development (FSD).

B. (U) Project 2334, Airborne Radar ECCM:

(U) FY 83: Complete roof-top and flight testing of the instrumented AN/APG-63 radar against various ECM. Output of this effort will provide direct benefits to the AN/APG-63 radar system and establish a firm data base for future airborne radar systems. FY 84: Initiate the development of an Adaptive Agile Radar ECCM concept for airborne interception, fire control, navigation, weapon delivery and A/A missile radars resulting in increased survivability and mission effectiveness in severe ECM environments. Initiate development of improved ECCM for the F-15 and F-16 fire control radars.

Program Element: #63750F Title: Counter-Countermeasures (CCM) Advanced Development
DOD Mission Area: Electronic & Physical Sciences (ATD), #551 Budget Activity: Advanced Technology Development, #2

C. (U) Project 2335, Communication and Navigation ECCM:

(U) FY 83: Complete testing of VLF/HF terminal and antenna, transition to full scale engineering development. Complete Troposcatter Communication System development and transition to FSED. Continue the development of a low cost data link that will provide for an affordable ECCM data link for a wide variety of applications including digital data/voice communications and weapon guidance. FY 84: Continue the low cost data link development. Initiate an improved air-to-air communication system that provides extreme resistance to jamming and intercept for critical short range air/air voice communications.

D. (U) Project 2347, Optical ECCM:

(U) FY 83: Continue development of counter-countermeasures for aircraft/weapons. Continue the analysis of COSTARS which will determine the feasibility of combining electro-optical and millimeter wave sensors for the functions of target discrimination (real vs decoy), search, screening and pre-classification. FY 84: Continue the COSTARS analysis. Initiate the development of counter-countermeasures for the next generation Forward Looking Infrared (FLIR) imaging sensor.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: N/A

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63751F
DOD Mission Area: #552 - Environmental and Life Sciences (ATD)

Title: Innovations in Education and Training
Budget Activity: #2 - Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	2,491	2,800	6,118	5,083	Continuing	N/A
1959	Advanced Systems for Human Resources Support of Weapon System Development	200	0	0	0	0	2,000
2359	Pilot Performance Measurement	400	500	868	300	800	3,900
2361	Maintenance Training Simulation	700	659	500	0	0	5,500
2362	Computer-Based Maintenance Aids	391	700	700	700	1,300	4,700
2557	Integrated Training Management System (ITS)	800	941	1,600	1,600	8,350	13,750
2744	Unified Data Base Application	0	0	1,225	1,265	5,100	7,800
2745	Logistics for Combat Readiness Maintenance	0	0	1,225	1,218	6,600	9,100

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Air Force must develop new ways of lowering training costs while actually improving training and the skill level of Air Force personnel. This program will develop technology and procedures to: (1) improve the value of flight simulators through use of automated measures of aircrew performance, (2) increase technical training productivity and reduce cost through the use of training simulators rather than operational equipment; (3) improve on-the-job training and the quality of technical school graduates; (4) increase the productivity of maintenance technicians through the development of a computer-based technical data system; and (5) decrease life cycle costs and improve logistics planning by including human factors considerations early in the design of weapon systems.

Program Element: #63751F
DOD Mission Area: #552 - Environmental and Life Sciences (ATD)

Title: Innovations in Education and Training
Budget Activity: #2 - Advanced Technology Development

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
RDT&E	2,491	3,073	6,309		Continuing	N/A

4. (U) OTHER APPROPRIATION FUNDS: Not applicable.

5. (U) RELATED ACTIVITIES: Related Air Force program elements are 61102F, Defense Research Sciences; 62205F, Training and Simulation Technology; and 63227F, Advanced Simulator Technology. Navy and Army Program Elements are 62757N, Human Factors and Simulation Technology; 63701N, Human Factors Engineering Development; 63720N, Education and Training; 63727N, Navy Technical Information Presentation System; 62722A Manpower, Personnel and Training; 63743A, Education and Training. There is a Memorandum of Agreement with the Military Airlift Command (MAC) that outlines responsibilities for development of the pilot/aircrew performance measurement system. The Air Force Human Resources Laboratory is working directly with Air Training Command in the demonstration and evaluation of the simulators for maintenance training. A triservice working group is assessing the total Department of Defense effort in technology development of simulation for maintenance training. The Navy Personnel Research and Development Center is conducting an effort to support HARDMAN which considers human resources in weapon system design. The Air Force Human Resources Laboratory manager for Project 1959 has coordinated efforts with the Navy's HARDMAN manager as well as the Army Research Institute, which is conducting a related effort. Much of the technology developed under Project 1959 is being used in the Army and Navy programs. The Air Force Human Resources Laboratory has a Memorandum of Agreement with the Deputy for Avionics Control Board, Aeronautical Systems Division, Wright-Patterson Air Force Base OH, for evaluation of Project 1959. The Army and Navy are conducting a joint effort to develop computerized technical data as a job aid for maintenance technicians at the flight line level. This complements the Air Force program which is focused on the intermediate or shop maintenance level. Several joint Air Force/Navy studies were performed in FY 1982 to solve common human factors problems.

6. (U) WORK PERFORMED BY: The program is managed by the Air Force Human Resources Laboratory, Brooks Air Force Base TX. Three Laboratory divisions support this program element: Logistics and Human Factors, Wright-Patterson Air Force Base OH, Operations and Training, Williams Air Force Base AZ, and Training Systems, Lowry AFB CO. These divisions are collocated with their primary Air Force customers to provide maximum technology transfer. The major contractors in FY 1982 were: Logicon, Incorporated, San Diego CA (2359); Westinghouse, Baltimore MD (1959); SAI Comsystems, Memphis TN (2557); Canyon Research, Westlake Village CA (2361); McDonnell-Douglas, St Louis MO (2361). Eight additional contractors ($891K).

Program Element: #63751F
DOD Mission Area: #552 - Environmental and Life Sciences (ATD)

Title: Innovations in Education and Training
Budget Activity: #2 - Advanced Technology Development

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: 1959 - Advanced Systems for Human Resources Support of Weapon System Development. This project is classified in the human factors Congressional category. The Department of Defense requires each military service to incorporate cost saving measures and to make quantitative assessments of operating and support costs for weapon systems under development and for major modifications to existing systems. The goal is to reduce life-cycle costs. In support of this goal, the Air Force Human Resources Laboratory has developed or has contributed to the development of technologies which have as their objectives the improvement of personnel performance in maintenance and ground support for weapon systems and reducing the cost of ownership of these systems. This project was completed in FY 1982 and a report, in which the integration of manpower, personnel, and training considerations are examined in the life-cycle costing of a weapon system, was provided to the Aerospace Systems Division of Air Force Systems Command.

B. (U) Project: 2359 - Pilot Performance Measurement. This project is classified in the simulation and training devices Congressional category. Currently, subjective assessments of aircrew proficiency are provided by on-board flight instructors and/or examiners in both the simulator and the aircraft. However, there are human limitations in the amount of information an instructor can process at the same time. It is virtually impossible for an instructor to monitor all the required actions and aircraft states which are important for each phase of flight. Also, there are limitations in terms of the degree for which standardization can be achieved across the spectrum of instructors and examiners. This project will overcome these limlitations by providing an automated aircrew performance measurement system in which equivalent measures of performance can be computed in both the simulator and the aircraft. The automated performance measurement system (PMS) for the C-5 simulator was completed in FY 1982, and a training effectiveness evaluation of the simulator PMS will be initiated in FY 1983. Also in FY 1983, a study of the design requirements for an airborne PMS to be installed on an operational C-5 aircraft will be accomplished. In FY 1984, the airborne PMS will be completed. Evaluation studies of the utility of the simulator PMS to the Military Airlift Command will continue. When the airborne PMS is used in conjunction with the C-5 flight simulator performance measurement system already developed, it will provide important data on the transfer of training from simulators to aircraft. This system may result in the reduction of the number of training flights required for weapon qualification. A five percent increase in training system efficiency through integration of simulator and airborne PMS would result in savings of $5 million per year. The integrated PMS could increase pilot production by 10 to 20 percent at no extra cost.

C. (U) Project: 2361 - Maintenance Training Simulation. This project is classified in the simulation and training devices Congressional category. The Air Force needs hands-on training using cost-effective maintenance simulation devices. Actual equipment used for training breaks down frequently which minimizes actual hands-on training. The development of low-cost computers has made maintenance training simulation a viable alternative to the use of actual equipment for training equipment operators and maintainers. Since this technology is relatively new, an information base that matches training capabilities and provides cost data has not been established. A high fidelity or very realistic simulator may cost more than the actual equipment, while a low fidelity trainer may yield the desired training outcomes at a fraction of the cost of the actual equipment. Furthermore, simulation can provide a richer training experience through features like embedded training strategies and fault location, but instructional and equipment designers have little documentation on what works to aid them in their task. A need exists to determine the types and respective levels of fidelity required of simulators and the procedural guidelines for simulator acquisition. The major products of this project include usable prototype simulators for the avionics courses at Lowry Technical Training Center, documented experiences and data to assist instructional designers in acquiring simulators for new or existing weapon systems, documentation/design guides and model specifications to assist those who will design the simulators, and data to indicate what level of fidelity a simulator must have to attain specified learning objectives. In FY 1982, evaluation of a two-dimensional graphics simulator will be completed. Evaluation of flight simulator maintenance training simulators will be initiated in FY 1982 and will be completed in FY 1983. A strategic missile maintenance training simulator will be delivered in FY 1982 and evaluation will be completed in FY 1983. Synthesis of intermediate-level maintenance simulation fidelity requirements will be completed in FY 1983. Final handbooks and model specification will be delivered at the end of FY 1984.

D. (U) Project: 2362 - Computer-Based Maintenance Aids. This project is classified in the simulation and training devices Congressional category. The Air Force Logistics Command needs a computerized, deployable technical information storage and retrieval system to improve maintenance performance in a mission readiness posture. This project will develop, demonstrate and evaluate a prototype, deployable, intermediate maintenance shop-level, computerized technical order (T.O.) system. This prototype computer-based maintenance aid will include an interactive computer terminal that interfaces with a computer-based technical data system. The system will substantially reduce technical data search and retrieval time by the technicians and improve aircraft systems repair quality and time to completion. In FY 1982 joint studies with the Navy determined the optimal computer terminal screen size, display resolution, and level of detail in computer graphics needed for a computerized maintenance data system. In FY 1983 the definition of the requirements of the deployable computerized technical data system will be completed and the development of the system will be started. In FY 1984, development of the prototype computerized maintenance data system will be completed and tested for incorporation in the B-1B aircraft program. This program will convert the current paper-bound T.O. system to a computerized format that can be used by technicians in the field.

E. (U) Project: 2557 - Integrated Training Management System (ITS). This project is classified in the education and training Congressional category. The current on-the-job training program is a manual, labor intensive system that is not responsive to operational needs. Also, it is limited by the excessive administrative burden it imposes and by the lack of an integrated approach to support and conduct of job-site training. This project will provide: (1) improved training management and simplificaton of administration, (2) improved identification and updating of training requirements, (3) improved evaluation techniques to ensure training quality control, (4) methodologies to determine the cost of OJT and the capacity of units to conduct OJT, and (5) better utilization of training technologies. In FY 1982, user requirements were identified, the procurement package for the development effort was initiated, and ITS development site selection was completed. In FY 1983, work on the management, evaluation, personnel, computer support, and training delivery subsystems will be initiated and will continue throughout FY 1984, resulting in large funding increases from FY 1982 through FY 1984.

Program Element: #63751F

DOD Mission Area: #552 - Environmental and Life Sciences (ATD)

Title: Innovations in Education and Training

Budget Activity: #2 - Advanced Technology Development

F. (U) Project: 2744 - Unified Data Base Application. This project is classified in the human factors Congressional category and is a new start in FY 1984. The Air Force Logistics Command and system program offices have a common need for a unified data base (UDB) containing performance data on weapon systems for which planners, designers, and logisticians can build supportable weapon systems. Currently, there are various data bases which have different formats, are difficult to change, have limited use, and require a high level of skill to fully utilize. This project will design and apply a prototype unified data base, which will be easy to use and will conform to the human factors needs of the users, to selected weapon systems in different stages of development. The data collected and technology used to collect the data will, in turn, support development of future weapon systems by guiding planners at each stage of the development process. Such technology will enable weapon system planners to more accurately estimate training needs and integrate training requirements in the early stages of weapon system development. In FY 1984, this new project will begin development of the technology for a unified maintenance data base covering all major weapon systems and develop a user-friendly integration technology incorporating the many separate data bases currently used to track the logistics support requirements of major systems. Such data base integration technology will increase the overall efficiency of maintenance support functions. This will be accomplished by integrating various logistics data bases which are not usable by most of their potential users because these data bases have not been designed with the human factors requirements of their users in mind. The funding increase in this project from FY 1983 to FY 1984 is due to project start-up and necessary front-end analyses.

G. (U) Project: 2745 - Logistics for Combat Readiness Maintenance. This project is classified in the human factors Congressional category and is a new start in FY 1984. The Air Force needs to determine logistics requirements during wartime conditions. There are currently no analytical tools nor procedures to determine these requirements. This project will simulate combat scenarios in order to determine logistics needs based on maintenance demand rates and sortie generation requirements. The computer simulation models and other analytical tools will be available for managers to use in assessing the combat capabilities of their maintenance organizations. In FY 1984, this new project will evaluate the capability of a peacetime unit to perform maintenance functions in a combat environment, thereby closely aligning peacetime operations and training with projected wartime requirements. Work will also be initiated on modeling the critical requirements for successful accomplishment of the war zone maintenance mission. Maintenance procedures, which would be modified under combat conditions, will be identified, and their utility for increasing combat readiness will be evaluated with computer simulation models. As a result, peacetime operations and training will be more closely aligned with projected wartime requirements. In the future, computer simulations of the effectiveness of alternative combat maintenance procedures will be completed and a field test of these procedures will be conducted at an operational base in an operational unit. The funding increase in this project from FY 1983 to FY 1984 is due to project start-up and necessary front-end analyses.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63789F
DOD Mission Area: #551 - Electronic & Physical Sciences (ATD)

Title: Command, Control & Communications Advanced Development
Budget Activity: #2 - Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	10,950	18,295	16,715	23,665	Continuing	N/A
2314	Tactical Air Surveillance	2,810	9,695	10,580	10,265		
2315	Automated Tactical Intelligence	3,330	3,900	2,200	6,600		
2317	Tactical Info Proc & Distribution	3,972	3,550	2,935	4,800		
2321	Advanced Systems Concepts	122	250	200	500		
2478	Tactical C^3I Architecture	716	900	800	1,500		

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element develops and demonstrates technology for surveillance, communications, and intelligence to support the maintenance of air space superiority and close air support missions in tactical operations. It involves the evaluation of technology conceptual systems design, system engineering, and fabrication of advanced development models for test and demonstration. This program provides for the transition from exploratory development to engineering development for those emergent projects that have demonstrated the potential to satisfy Air Force requirements.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	10,162	18,295	21,286		Continuing	N/A
Procurement	Not Applicable					

The FY 1982 program was increased to accelerate the NORAD demonstration (See Project 2317).
The FY 1984 program was reduced to provide funds for higher priority needs within the Department of Defense.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable

5. (U) RELATED ACTIVITIES: Related Program Elements include: 62702F, Command, Control, Communications, and 63742F, Combat Identification Technology, for emergent technology; 27412F, Tactical Air Control System, and 27422F, Tactical Air Control System Communications, 27431F, Tactical Air Intelligence Systems and 64321F, Joint Tactical Fusion Program, for engineering development of demonstrated solutions to operational requirements. PE 63750F, Counter Countermeasures, and technology developed by other sources is utilized to satisfy requirements for future engineering development and acquisition activities. Projects within this program element are coordinated with the Army, Navy and Marine Corps.

Program Element: #63789F Title: Command, Control & Communications Advanced Development
DOD Mission Area: #551 - Electronic & Physical Sciences (ATD) Budget Activity: #2 - Advanced Technology Development

6. (U) WORK PERFORMED BY - The program is managed by Air Force Systems Command, Andrews AFB, MD, with project efforts being conducted by the Electronic Systems Division, Hanscom AFB, MA and Rome Air Development Center, Griffiss AFB, NY. Current contracts are with: Sperry Gyroscope Corp., Great Neck, NY (2314); Pattern Analysis & Recognition Corp., Rome, NY (2315); Martin Marietta Aerospace, Denver, CO (2317); TRW, Redendo Beach, CA (2315); RCA, Moorestown, NJ (2315); and 17 other contracts valued at $11.3 million.

7. PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: 2315/A omated Tactical Intelligence - This project develops the technology base (prototype equipment, techniques and procedur) needed to satisfy future operational tactical intelligence requirements for processing of increasingly large amounts of data provided by existing and future automated intelligence sensors, and to provide timely analysis for commanders. FY82 accomplishments: A laboratory demonstration of an Advanced Sensor Exploitation (ASE) System for collectively managing and exploiting multiple, diverse, high capacity intelligence sensors was completed. An equipment configuration design study for integration of exploratory technology into a system for near-real-time image processing, target identification and location was completed. FY83 Programs: A field demonstrations model of ASE will start. Integration of image processing technology into a system will continue. FY84 Planned Program: The ASE field test model will be configured and operationally tested and evaluated. Development of a Multi-Imagery Exploitation System advanced development model will continue, with testing and evaluation beginning in FY86. A task titled Advance Tactical Air Intelligence Systems Modules will begin. This task will identify current deficiencies in the tactical intelligence process and demonstrate promising new technologies for transitioning to engineering development.

B. (U) Project: 2317/Tactical Information and Distribution - This project develops equipment and techniques to upgrade communications and information processing functions. The technologies involved are communications Local Area Networks (LAN), radar communications, and communications processing. FY82 Accomplishments: Design, fabrication, and checkout of the Flexible Intraconnect (FI) LAN was completed. A contract was awarded to demonstrate the FI LAN at the NORAD Off-Site-Test Facility. FY83 Programs: Design will be completed and installation will begin of the FI LAN at NORAD. The integrated radar and communications definition will be initiated. FY84 Planned Program: Demonstrate the Flexible Intraconnect LAN at the NORAD Off-Site Test Facility. Continue development of general purpose local area communications networks. Continue development of integrated radar and communication equipment for the Advanced Tactical Radar (2314).

C. (U) Project: 2321/Advanced Systems Concepts - The Advanced Systems Concepts Project aids in selection of techniques, procedures, and equipments for development based on their potential for cost effectively increasing Air Force capabilities. FY82 Accomplishments: Testing of an improved communications system for the Air Support Operations Center/Tactical Air Control Party system was successfully completed. FY83 Program: Begin development of a knowledge based computer decision aid for Air Tasking Order mission planning using Artificial Intelligence techniques. FY 84 Planned Program: Continue development of Artificial Intelligence techniques for decision aids.

Program Element: #63789F

DOD Mission Area: #551 - Electronic & Physical Sciences (ATD)

Title: Command, Control & Communications Advanced Development

Budget Activity: #2 - Advanced Technology Development

D. (U) Project: 2478/Tactical C^3 Architecture - This project provides the time-phased implementation planning required for technology transition of command, control, communications and intelligence systems. FY82 Accomplishments: The first phase for the NATO Central Region architecture was completed. FY83 Program: Continue development of theater tactical command, control and communications architectures focusing on the Pacific Region. FY 84 Planned Program: Continue Pacific Theater architecture development.

8. (U) Project over $10 million in FY 84: 2314 - Tactical Air Surveillance

A. (U) Project Description - This project evaluates technology, conceptual design, system engineering, and demonstrates equipment and procedures needed to correct operational deficiencies, and satisfy requirements for tactical air surveillance. The program includes ground radar development and sensor internetting.

B. (U) Program Accomplishments and Future Efforts

(1) (U) FY 82 Accomplishments: Two breadboard phased array antenna models were designed, fabricated, and tested for performance testing in severe jamming and high clutter environments. As a result of these tests, a high degree of confidence was obtained that an Advanced Tactical Radar (ATR) could be developed with the required performance levels. During FY 81 and FY 82, an ATR specification was formulated and released to industry for the design, development, and testing of an Advanced Development Model of the ATR. A detailed proposal evaluation was conducted from Jan-Aug 82 leading to a contract award in August 1982 with delivery of the prototype ATR in Aug 85. Two Advanced Tracking Systems to support both netting and surveillance radar technology demonstrations were also developed.

(2) (U) FY 1983 PROGRAM: Continue contractual development of the Advanced Tactical Radar. Transition the Advanced Tracking System to PE 27412F for acquisition. Initiate laboratory demonstration of basic surveillance network with integrated aircraft identification capability using advanced tracking systems, Laboratory radar, and an AN/TPS-43E radar.

(3) (U) FY 1984 Planned Program and Basis for FY 84 RDT&E Request: Continue development of the Advanced Tactical Radar, scheduled for test in FY 86. Initiate efforts to develop solid state transmit/receive modules for incorporation in the Engineering Development Model of the ATR. Continue the internetting efforts.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones

	Major Milestones	Date
A.	Advanced Tactical Radar Contract Award	August 1982
B.	Surveillance Network Single Site Test	December 1983
C.	Solid State Modules Contract Award	April 1984
D	Surveillance Network Dual Site Test	July 1985
E.	Advanced Tactical Radar Development Completed	August 1985
F.	Advanced Tactical Radar Test Completed	September 1986

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63258F
DOD Mission Area: # 113, Airborne Strike

Title: Common Strategic Rotary Launcher (CSRL)
Budget Activity: Strategic Programs, #3

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	21,900	60,178	41,473	63,586	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: A need exists within the Strategic Air Command to develop a Common Strategic Rotary Launcher for the B-52H, B-1B and eventually for the Advanced Technology Bomber (ATB). The need is for a multipurpose launcher that can accommodate current and projected gravity weapons, Short Range Attack Missile (SRAM), and cruise missiles. The critical path for deployment is represented by the B-52H internal IOC of Oct 1986. September 1986 will be used as the B-1B IOC. A special supplement for the ATB concept will be available within appropriate security channels and should be considered as additive to the requirements contained in this document.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
RDT&E	22,400	64,078	63,176		Continuing	N/A
Procurement (3010)	Not applicable					

(U) RDT&E Differences:

A. (U) FY 1982: Five hundred thousand dollars was reprogrammed to PE 63601F, Conventional Weapons Technology.

B. (U) FY 1983: Program was reduced by $3.9 million due to Program Budget Decision

C. (U) FY 1984: Due to Program Budget Decisions, funds were deferred from FY 1984 to FY 1985 to realign the budget with incremental funding policies.

Program Element: #63258F | Title: Common Strategic Rotary Launcher (CSRL)
DOD Mission Area: # 113, Airborne Strike | Budget Activity: Strategic Programs, #3

4. (U) OTHER APPROPRIATION FUNDS: ($ IN THOUSANDS) Procurement funds are included in Program Element 11113F and are listed in that Program's Descriptive Summary.

5. (U) RELATED ACTIVITIES: All related activities are Special Access programs.

6. (U) WORK PERFORMED BY: The program is currently undergoing source selection with three competing contractors. They are:

Boeing Military Airplance Company, Wichita, Kansas
Rockwell International Corporation, El Sequndo, California
Grumman Aerospace Corporation/Western Gear, Bethpage, New York

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not applicable

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

A. (U) Description: The growing strategic imbalance requires that bombers efficiently carry the maximum weapons possible. More weapons are required as the Soviet target base continues to expand and high value targets are further hardened, which may require multiple nuclear strikes. Future force structures require the flexibility to carry up to the maximum possible load. Since probability of Launch Survivability is greater on alert aircraft than for follow-on aircraft, the majority of alert aircraft will have full weapon loads. The CSRL will allow the Operating Command to effectively pursue the goals of survivability, durability and flexibility.

(U) The Air Force initiated a cruise missile roadmap study in July 1981 which included the objective of investigating the various rotary launcher designs being considered for the ATB concepts, the B-52, and the B-1B. At least five launcher designs were being planned for the three bombers (a launcher for a ATB concept; separate SRAM, gravity, and ALCM designs for the B-1B; and an ALCM launcher for the B-52) as well as modified SRAM launcher for the B-52. The Conventional Standoff Weapons and MRASM missiles are also to be deployed on internal launchers which required further launcher modification/redesign or still another launcher design. The objective was to attempt to reduce the number of designs by pursuing a common launcher design concept. It was determined that a highly common multipurpose launcher design could be adapted for use on all three bombers. Along with the reduction of launcher designs, support equipment designs could also be consolidated in an attempt to realize maximum commonality and life cycle cost benefits.

Program Element: #63258F Title: Common Strategic Rotary Launcher (CSRL)
DOD Mission Area: # 113, Airborne Strike Budget Activity: Strategic Programs, #3

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The CSRL program was directed in April 1982. A source selection was held in May-June 1982 to select contractors for the Phase One study effort. In late August 1982, the Air Force redirected the CSRL program to incorporate the Advanced Cruise Missile (ACM). This action required the CSRL schedule to match the ACM schedule resulting in an acceleration of study tasks. A Phase Two Statement of Work was released on 15 September 1982 with provision that the competing contractors have sixty days to prepare Full Scale Development and Long Lead production proposals.

(2) (U) FY 1983 Program: The Phase Two study will culminate with Source Selection on April 1, 1983 and Full Scale Development will begin. CSRL and B-52 kit design are continuing with Preliminary Design Review scheduled for May 1983. Long Lead procurements originally programmed to begin this fiscal year, is deferred to FY 1984 as a result of Congressional action deleting FY 1983 procurement funds.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Long lead production will begin resulting in the manufacture of five Full Scale Development units. Extensive structural ground tests will also begin this fiscal year culminating with a Critical Design Review in January 1984. Integration and checkout will occur in the System Integration Laboratory Test Facility. Software interface with the B-52 Offensive Avionics Systems Block Two update will dovetail both programs into a common operational capability date.

(U) Government parametric estimates based on a competitive program serve as basis for funding. Estimate will be updated as a result of source selection in April 1983.

(4) (U) Program to Completion: Flight test of a B-52H will occur in FY 1985. At the completion of flight test, the B-52 modification program will begin with completion scheduled for FY 1989.

C. (U) Major Milestones:

Milestones	Dates
1. Phase One Study	July 1982
2. Incorporation of Advanced Cruise Missile to CSRL	August 1982
3. Phase Two Study	September 1982
4. Source Selection/Full Scale Development	April 1983
5. Preliminary Design Review	May 1983
6. Critical Design Review	January 1984
7. B-52H Initial Operational Capability	October 1986

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63311F Title: Advanced Strategic Missile Systems (ASMS)
DOD Mission Area: #111 - Land Based Strike Budget Activity: #3 - Strategic Programs

1. (U) RESOURCES (PROJECT LISTING): ($ In Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	99,624	49,737	97,537	127,021	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This is the Air Force program for ballistic missile advanced development and provides the Department of Defense capability for intercontinental range flight testing of exploratory reentry vehicles and penetration aid systems for the three Services. The Advanced Strategic Missile Systems (ASMS) program includes reentry design and testing pursued in the former Advanced Ballistic Reentry Systems (ABRES) program as well as advanced development for improvements in other ballistic missile and basing subsystems. Early development testing is pursued to gain confidence in engineering feasibility of new technologies and to insure their readiness for full scale weapon development.

Soviet throwweight advantages, their capability to field advanced anti-ballistic missile defenses [ ] their continuing program to upgrade offensive effectiveness (e.g., increased missile accuracy), their increased pace in projecting force, all point to a need for the United States to be prepared to upgrade the missile force with offsetting advanced weapons. As an added potential benefit of this program, publicly acknowledged demonstrations of advanced weapons can serve to divert Soviet spending toward costly countermeasures which are less threatening to the United States than corresponding Soviet investments in increased numbers of offensive weapons.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	99,624	49,737	61,841		Continuing	N/A

(U) The FY 1984 request is $35.696 million above last year's estimate, reflecting two factors: a reestimation of outyear costs to complete ICBM penetration aids development contracts begun in late FY 1982, and increased development pace for reentry weapons, missile guidance and basing subsystems recommended in Air Force and Department of Defense studies.

4. (U) OTHER APPROPRIATION FUNDS: ($ In Thousands) None

5. (U) RELATED ACTIVITIES: This program includes advanced development previously pursued in the Advanced Ballistic Reentry Systems (ABRES) program (PE 63311F) and the Advanced Intercontinental Ballistic Missile Technology program (PE 63305F). The program is coordinated with the Army's Systems Technology Program and Ballistic Missile Defense Advanced Technology Center; the Navy's Strategic Systems Program Office; the Defense Advanced Research Projects Agency; the Defense

Program Element: #63311F | Title: Advanced Strategic Missile Systems (ASMS)
DOD Mission Area: #111 - Land Based Strike | Budget Activity: #3 - Strategic Programs

Nuclear Agency; the Department of Energy, Military Applications; Government laboratories and testing facilities; and other agencies dealing with ballistic missiles and associated basing. Efforts are coordinated with the Minuteman program (PE 11213F) and the Peacekeeper program (PE 64312F) for development of advanced reentry vehicles; penetration aids systems; advanced missile guidance; evaluation of deceptive, defended, closely spaced and mobile basing; and demonstration launches. Tri-Service and intra-Air Force coordination is accomplished through annual program reviews and working level exchanges. Effective coordination and avoidance of duplication with the Minuteman and Peacekeeper programs is achieved through joint management and collocated program offices within the Ballistic Missile Office.

6. (U) WORK PERFORMED BY: The responsible Air Force agency is the Ballistic Missile Office, Norton Air Force Base, CA. Major contractors include: Avco Corporation, Wilmington and Everett, MA (penetration aids, launch support); Boeing Aerospace Company, Seattle, WA (Minuteman I booster launch services); General Electric Company, Philadelphia, PA (reentry weapons and penetration aids); TRW Systems Group, San Bernardino, CA (systems engineering support and flight test targeting); Tracor Aerospace, Austin, TX (penetration aids, deployment devices). The ASMS program currently maintains 51 contracts and makes extensive use of Government laboratories. Total definitized value of current contracts is $322 million, with some periods of performance extending through 1986.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. (U) ADVANCED STRATEGIC MISSILE SYSTEMS (SINGLE PROJECT OVER $10 MILLION IN FY 1984):

A. Project Description: FY 1984 funds will be spent primarily for advanced development of a ballistic missile defense (BMD) penetration system for Minuteman III and Peacekeeper. Readiness of such a system has increased in importance given Soviet advanced development of ballistic missile defenses and their deployment of new defensive components around Moscow, [ ] Funds will also be spent for development of advanced penetration concepts and for testing of advanced dormant precision guidance and subsystems for ICBM basing flexibility and operating cost reductions. Effort will continue in ground testing of [ ] missions.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) FY 1982 Accomplishments: Contracts were awarded to develop a defense penetration system for Minuteman III and Peacekeeper. Designs were begun [ ] decoys (to match and conceal ballistic reentry vehicles), deployment systems, and engineering assessment of specialized defense suppression weapons. Other accomplishments include transition of the MK21 Advanced Ballistic Reentry Vehicle into the Peacekeeper full scale development program; conduct of studies for defended and deceptive ICBM basing concepts including closely spaced basing (as provided for in FY 1982 Authorization Conference Committee language); offense oriented analysis to support realism of potential Army approaches to defend Air Force ICBMs; laboratory testing of dormant ring laser gyro guidance instruments for missiles; concept studies begun for single warhead missile and basing components emphasizing affordability, targeting flexibility, long endurance, and deceptive or mobile ICBM basing; ground testing of [ ] low level laboratory testing of homing sensors for maneuvering reentry vehicle guidance; and Minuteman I flight test support (1 flight) for the Army Ballistic Missile Defense advanced development program.

Program Element: #63311F Title: Advanced Strategic Missile Systems (ASMS)
DOD Mission Area: #111 - Land Based Strike Budget Activity: #3 - Strategic Programs

(2) FY 1983 Program: Design work is continuing and ground tests are beginning for Minuteman III and Peacekeeper defense penetration system components and for early defense suppression weapon development; payloads will be prepared for sounding rocket flight tests of reentry vehicle signature masking chaff; decoy payloads will be fabricated for two ICBM flight tests to be conducted in FY 1984. Low level definition and testing efforts will continue for [ ] ICBM guidance and subsystems. Minuteman I flight test support is being provided for five Army Ballistic Missile Defense development tests.

(3) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: FY 1984 funds will be used to continue advanced development of penetration aids for Minuteman III and Peacekeeper as countermeasures to Moscow defense upgrades in progress and as a hedge against deployment of defenses beyond Moscow. Design, fabrication, and functional ground tests will continue for ballistic reentry vehicle decoys, [ ] sequencing electronics, bus deployment mechanisms and ICBM delivered defense suppression weapons. Sounding rocket flight tests will be conducted to test reentry vehicle signature masking chaff. Two ICBM range Minuteman I flight tests of the decoy and chaff components will be conducted in FY 1984. These ICBM flight tests will provide data needed for operational system design and reentry signature evaluation [ ] Fabrication and functional testing will continue in preparation for a further flight test of decoys (a Minuteman I test in FY 1985) and deployment mechanism feasibility (two Peacekeeper flight tests in FY 1986-87). Joint studies will be undertaken with the ballistic missile defense community to understand offense and defense relationships (i.e., "red-blue" studies).

Funds will also be spent to conduct testing and design integration of advanced dormant guidance and low power consuming subsystems for advanced ICBM basing concepts under study (e.g., transportable, base mobile) to achieve reductions in operating costs. Low level ground tests and technology planning will continue for [ ] of special targets and in support of advanced airbase defense concepts. Aerodynamic, aerothermal and impact damage tests will be conducted. Costs for ASMS tasks were estimated as of December 1982, based on negotiated contractor prices and Government experience on similar advanced development programs.

(4) Program to Completion: The third Minuteman I development flight test of Minuteman III and Peacekeeper decoys will be conducted in FY 1985. Two integrated penetration deployment system flight tests will be conducted on Peacekeeper missiles in FY 1986-87. Follow-on Minuteman I flight tests will be conducted in the outyears for upgrades to the Minuteman III and Peacekeeper penetration system options (e.g., decoys, defense suppression, maneuvering vehicles), to meet the evolving Soviet defensive threat. Advanced development of other missile subsystems and tailored weapons [ ] will be reinitiated in FY 1985, flight test preparations will begin for [ ] weapons, and system level tests of ICBM dormant guidance will continue. This is a continuing program.

C. (U) Major Milestones: Not applicable since decisions have not been made to pursue engineering development, production or deployment of these systems. Advanced development milestones are described above.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63424F — Title: Missile Surveillance Technology
DoD Mission Area: Strategic Surveillance and Warning, #332 — Budget Activity: Strategic Programs, #3

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	14,498	9,745	7,429	0	0	41,937

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element (PE) has two major activities involving the collection and analysis of infrared phenomenology. The first is associated with the Earth and its surrounding atmosphere as a background, and the second is directed at specific targets such as strategic and tactical missiles. Background data are collected by high altitude balloons in the Balloon Altitude Mosaic Measurement (BAMM) program, and target signatures are gathered in the Target Engine Measurement (TEM) program. Data from these programs will directly support design considerations for a survivable/enduring strategic missile warning and attack assessment system that will support National Command Authorities' response option selection during all phases of nuclear conflict.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	13,848	9,745	7,674		Continuing	N/A

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable

5. RELATED ACTIVITIES: [ ] is the current space-based missile early warning system. Data from this PE are being specifically gathered to support the follow-on missile warning systems, the Advanced Warning System, PE 63425F.

6. (U) WORK PERFORMED BY: Marietta Corporation, Denver, CO, (ultraviolet sensors); Honeywell Radiation Center, Lexington, MA, (spectral radiometers); and Aerodyne Inc., Burlington, MA, (computer data analysis); and Visidyne Inc., Burlington, MA. HQ Space Division (SD), Los Angeles, CA, is responsible for the management of the PE. Additional DoD agencies are the Air Force Geophysics Laboratory, Hanscom AFB, MA; White Sands Missile Range, NM; and Air Force Materials Laboratory, Wright-Patterson AFB, OH.

7. (U) SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984:

A. (U) PROJECT DESCRIPTION: 2123, Measurements. Balloon Altitude Mosaic Measurements flights have been programmed to measure the infrared radiation from various types of terrestrial backgrounds. These backgrounds include mountains, lakes, ocean glitter, clouds, and snow. The second part of the project is directed toward obtaining actual infrared data from rocket engines in flight. This is done by launching an infrared sensor package along with an upper stage. When the target upper stage is deployed, the sensor package is ejected, and it then observes the upper stage going through a sequence of firings.

B. (U) PROGRAM ACCOMPLISHMENT AND FUTURE EFFORTS:

(1) (U) FY 1982 Accomplishments: A Balloon Altitude Mosaic Measurement (BAMM) flight for gathering infrared data on Earth backgrounds was succesfully completed in May 82, and a Target Engine Measurements (TEM) rocket probe flight for viewing rocket motors in flight was successfully completed in May 82.

(2) (U) FY 1983 Program: The FY 83 effort will be to prepare for the final balloon and rocket probe flight in FY 84. The first of these balloon flights is scheduled for October 1983.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Two BAMM flights are scheduled for early and mid FY 84. These flights are programmed to look at the transitions between land and ocean, and between mountains and plains. A Target Engine Measurement (TEM) probe launch is scheduled for mid FY 84. Previous TEM launches have used the Aries I booster. This next flight will use the more powerful Aries II booster, a refurbished Minuteman I ICBM, allowing it to more closely duplicate the altitude and speed regime of an ICBM flight. All activity in this program should be completed by FY 84, with the measurements data analysis feeding into the Advanced Warning system program for system development.

(4) (U) Program to Completion: Complete in FY 1984.

C. (U) MAJOR MILESTONES:

MAJOR MILESTONES	DATES
Balloon Flight	Oct 83
Balloon Flight	Apr 84
Rocket Probe	Apr 84

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63425F — Title: Advanced Warning System

DoD Mission Area: Strategic Surveillance and Warning, #332 — Budget Activity: Strategic Programs, #3

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	7,962	10,000	30,883	76,178	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The objective of this program is development of infrared technology (i.e., mosaic sensor arrays, large capacity data processors, lightweight optics, tunable spectral filters, and passive/active thermal coolers), relevant to the strategic missile warning and attack assessment mission, to achieve confidence for a decision to proceed with development of a survivable tactical warning/attack assessment system capable of performing the missile warning functions throughout all phases of nuclear war. The capability to support additional missions such as technical intelligence, tactical theater operations, and air vehicle detection and tracking will be investigated with this program.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY ($ in thousands):

RDT&E	9,962[1]	20,808[2]	48,738		Continuing	Not Applicab

[1] (U) The $2M decrease in RDT&E funds for FY 82 was due to a reallocation to other high priority Air Force programs.

[2] (U) The full amount of the FY 83 request was not appropriated by Congress.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

5. RELATED ACTIVITIES: [ ] is the existing space-based missile early warning system. Infrared background and target measurements are conducted in PE 63424F, Missile Surveillance Technology.

6. (U) WORK PERFORMED BY: Rockwell International, Thousand Oaks, CA; Grumman Aerospace, Irvine, CA; Irvine Sensors, Costa Mesa, CA; Honeywell, Minneapolis, MN. Air Force Systems Command is responsible for overall management of this program element. DARPA provides technical guidance through the joint program plan. Space Division, Los Angeles, CA, Rome Air Development Center, Griffiss AFB, NY, and Aeronautical Systems Division, Wright-Patterson Air Force Base, OH, are responsible for management of technology development projects associated with the joint development program.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 84: Not Applicable.

Program Element: #63425F
DoD Mission Area: Strategic Surveillance and Warning, #332

Title: Advanced Warning System
Budget Activity: Strategic Programs, #3

8. (U) PROJECT OVER $10 MILLION IN FY 84:

(U) PROJECT: 2847, Advanced Warning System (AWS)

A. (U) PROJECT DESCRIPTION: AWS is being designed to provide a survivable and enduring missile warning system throughout a nuclear conflict. The use of new technologies such as mosaic focal plane and on board data processing will make AWS capable of providing missile warning and attack assessment data direct to users, eliminating the need for vulnerable ground processing stations. The capability to satisfy additional missions such as tactical theater, technical intelligence, and air vehicle detection and tracking will also be evaluated. Several technology development contracts will be initiated to achieve those objectives.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) (U) FY 82 Accomplishments: Work on developing focal plane technology has proceeded very smoothly and comprises the bulk of the FY 82 effort. Integrated circuit chips for two of the alternate concepts have been produced. These chips are now being stacked into modules to be combined into actual focal planes. Additionally, an engineering model of a tunable filter has been developed, and work is progressing in on-board processing.

(2) (U) Basis for FY 1983 RDT&E Request: The FY 1983 RDT&E program will continue the infrared technology program which was initiated in FY 1981. This includes development of broad band infrared mosaic sensors, compact data processors with large data capacity, and further evaluation of metal and glass lightweight optical components. Emphasis will be given to manufacturing methods for mosaic array and data storage chip fabrication.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The AWS program is intended to provide a survivable sensor system to augment or possibly replace the current missile surveillance system. A major objective of the AWS program is to efficiently develop the key subsystem technologies for several candidate concepts. The FY 84 effort will continue work begun by DARPA in FY 81 and picked up by the Air Force in FY 82. The program is concentrating on five critical technologies: infrared focal planes, on-board processors, tunable filters, lightweight optics, and cooling techniques. The majority of this effort is going into the staring mosaic focal plane. To minimize the risk, four contractors will pursue this effort in FY 83 and FY 84. At the end of FY 84, during a major program review, the focal plane configurations will be narrowed to two. During FY 84, this program will continue to be in advanced development, but the major program review will assess the status of all the technology efforts to determine if they can support a Full Scale Development decision in FY 85. To further support this full-scale development decision, conceptual system design work, will begin in FY 84. Therefore, the funds in FY 84 will pay for critical technologies and system concept design, leading to a full scale development, milestone decision in FY 85. The cost estimates were derived from a Program Office and Aerospace Corporation (Federal Contract Research Center) cost evaluation using contractor estimates and historical data from similar efforts.

(4) (U) Program to Completion: This continuing program is projected to begin full scale development in FY 85.

C. (U) MAJOR MILESTONES: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

PROGRAM ELEMENT: #63428F
DoD MISSION AREA: #332, Strategic Surveillance and Warning

TITLE: Space Surveillance Technology
BUDGET ACTIVITY: #3, Strategic Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

PROJECT NUMBER	TITLE	FY 1982 ACTUAL	FY 1983 ESTIMATE	FY 1984 ESTIMATE	FY 1985 ESTIMATE	ADDITIONAL TO COMPLETION	TOTAL ESTIMATED COSTS
	TOTAL FOR PROGRAM ELEMENT	27,710	20,285	22,563	38,640		
2698	System Development	21,983	6,783	12,248	29,421	Continuing	N/A
2699	Information & Network Development	1,600	3,785	1,497	1,677	Continuing	N/A
2841	Surveillance Technology	4,127	9,717	8,818	7,542	Continuing	N/A

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Soviets continue to pursue a dynamic and expanding military space program, including an aggressive, operational antisatellite (ASAT) system and satellite reconnaissance systems which are integrated with their ground forces. Our current space surveillance network (SPACETRACK) has limited detection capability above 3,000 nautical miles (nm), [

] This program pursues development of improved SPACETRACK capabilities including existing sensor upgrades, new capabilities for satellite mission assessment, and the primary effort to convert SPACETRACK to a near real-time, totally responsive space-based system for timely satellite attack warning and verification and [ ] with reduced dependence on overseas based sensors and with [ ] These efforts are specifically oriented toward the development of a space-based long wavelength infrared (LWIR) space object detection and tracking system. This program supports the Presidential and Secretary of Defense directives for a [ ] Mission need is documented in ADCOM Statement of Need (SON) 3-79, Air Force Mission Element Need Statement (AFMENS) for ASAT capability (validated by SecDef) and Justification for Major System New Start (JMSNS) for space surveillance (validated by Defense Resources Board).

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	RDT&E	23,711	40,285	46,609	--	Continued	N/A

Explanation of Changes: FY 1982-$2.3M added to Project 2841 to support space based radar technology efforts; FY 1983-$20.0M cut from Project 2698 by Congress after Air Force terminated Space Infrared Sensor (SIRE) demonstration; FY 1984-$20.4M reduced from Project 2698 and $3.0M reduced from Project 2699 by Air Force after funding profile was adjusted to support restructured program for prototype Space-Based Space Surveillance (SBSS) system development beginning in FY 1984.

PROGRAM ELEMENT: #63428F
DOD MISSION AREA: #332, Strategic Surveillance and Warning

TITLE: Space Surveillance Technology
BUDGET ACTIVITY: #3, Strategic Programs

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

5. RELATED ACTIVITIES: This program is part of a singly managed Space Defense Systems Program involving four functional areas: antisatellite (ASAT), space surveillance, space system survivability, and command and control. Program Element (PE) 64406F, Space Defense System, provides an ASAT system which [ ] PE 63438F, Satellite Systems Survivability, develops the technology base for enhancing survivability of satellite systems including satellites, data links and ground systems. The Defense Advanced Research Projects Agency's (DARPA) space object identification program and the tactical assessment of satellite mission efforts under the space surveillance program are integrated and have common technical management agencies. DARPA infrared surveillance technology program supports the technical requirements of the space-based long wavelength infrared (LWIR) system being developed by this program. PE 12424F, United States Air Force SPACETRACK incorporates the research and development efforts of this program into the operational SPACETRACK system. PE 12311F, NORAD Combat Operations Center, provides the command and control for these programs.

6. (U) WORK PERFORMED BY: Headquarters, Space Division, Los Angeles, CA, is responsible for overall management of the program. A.D. Little Corporation, Cambridge, MA, is developing a rotary reciprocating type cryogenic cooler. Hughes, Culver City, CA, is developing a vuilleumier-type cryogenic cooler, developing and demonstrating LWIR silicon mosaic focal plane array (MFPA) detectors and developing data processing algorithms required for the SBSS system. Hughes also built and tested the Space Infrared Sensor (SIRE) LWIR sensor. Rockwell International, Seal Beach, CA, and Aerojet General, Azuza, CA, also are developing and demonstrating LWIR silicon MFPA detectors. University of Arizona, Tucson, AZ, and Sensor Systems Group, Boston, MA, are developing optical technologies required to support the SBSS system.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

PROJECT: 2699 Information and Network Development. Provides a space surveillance architecture through the year 2000 and information processing improvements for satellite attack warning and verification (SAW/V) and improved orbital prediction and satellite mission assessment [ ] Advanced orbital processing techniques will be developed to improve orbit predictions. A surveillance system model will be used to evaluate improvements. This project includes development of sensor improvements for the tactical assessment of foreign satellite missions. A major study and mission analysis of the far term space surveillance architecture requirements and future threat environment was conducted in FY 82 and documented in the Air Force Space Surveillance Architecture briefing and final report in FY 83. A second phase surveillance architecture study is planned to integrate space, missile and air vehicle surveillance requirements and systems. In FY 84, Haystack and other space object identification (SOI) developments, orbital processing design and network analysis to support the Space Surveillance Architecture recommendations will continue.

8. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

(U) PROJECT: 2841, Surveillance Technology. Provides validation of key technologies required to support development of a SBSS system using LWIR sensors. Four areas of SBSS technology are being investigated mosaic focal plane array development; long-life, active, cryogenic cooler development; optics technology development; and data

PROGRAM ELEMENT: #63428F TITLE: Space Surveillance Technology
DOD MISSION AREA: #332, Strategic Surveillance and Warning BUDGET ACTIVITY: #3, Strategic Programs

processing development. These technologies will be pursued in parallel with SBSS system design efforts (Project 2698) to support a full-scale development decision milestone in FY 86. The Space Infrared Sensor (SIRE) program, which was ground tested in FY 81 and FY 82 provided successful demonstrations of a long wavelength infrared (LWIR) sensor, cryocoolers and optics components. Additional technology efforts were conducted to further validate these technologies and to develop data processing algorithms needed to accomplish angles-only tracking of satellites from a space platform. The five-year-life development program for the critical cryocooler continued. Seal life for the Vuilleumier (VM) cooler was extended from 3000 hours to 8000 hours and cooling performance required for the SBSS system was demonstrated. In FY 83, the surveillance technology project is continuing to demonstrate the technical feasibility and maturity of critical technologies required to support an LWIR sensor system and to examine and resolve remaining technical concerns of the SBSS sytem. Development and testing of VM and Rotary Reciprocating Refrigerator (R^3) coolers is continuing, with emphasis on VM cooler seals and R^3 cooler performance testing. Second generation mosaic focal plane detectors are being developed and tested. Optics technologies and data processing algorithms development is continuing. In FY 84, SBSS system technology validation efforts in the areas of cyrocoolers, focal plane, data processing and optics will continue. Both VM and R^3 approaches to space-qualified, long-life coolers will be developed. The required data processing algorithm and focal plane components necessary to support design and development of the SBSS prototype will be developed and demonstrated to provide technology validation required to support an FY 86 full scale engineering development (FSED) decision on SBSS. Technology efforts to reduce risk in prototype development and prepare for system production decision will be pursued. This is a continuing program.

9. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) PROJECT: 2698, System Development.

A. PROJECT DESCRIPTION: This project comprises two major efforts. The first is a long wavelength infrared (LWIR) background measurements probe program to characterize LWIR backgrounds[ ]and for a space-based space surveillance (SBSS) system using LWIR sensors. The second effort is design and development of a prototype SBSS satellite to validate the SBSS design and demonstrate its operational potential. The LWIR SBSS is the primary system designed to provide the near real-time[ ]satellite attack warning and verification (SAW/V) surveillance capabilities.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) (U) FY 1982 Accomplishments: The infrared (IR) background measurements probe (BMP) program is in progress with six of eight launches completed (two in FY 82). The Space Infrared Sensor (SIRE) development was completed following off-axis rejection testing of sensor optics. The program was then restructured to capitalize on the SIRE investment while proceeding directly to a prototype SBSS satellite.

(2) (U) FY 1983 Program: The probe measurements program will continue with one launch in FY 1983 to collect earthlimb background data. SBSS prototype planning will continue with request for proposal (RFP) preparation, RFP release and contract negotiations to cover the initial design phase of SBSS development.

PROGRAM ELEMENT: #63428F
DOD MISSION AREA: #332, Strategic Surveillance and Warning

TITLE: Space Surveillance Technology
BUDGET ACTIVITY: #3, Strategic Programs

(3) Planned FY 1984 Program and Basis for FY 1984 RDT&E Request: The probe measurements program will be completed, the results analyzed, and the data base provided to the ASAT and SBSS programs. A contract will be awarded for competitive design of a prototype hardened, survivable, SBSS system, with two contractors, through preliminary design review. Characteristics of planned SBSS system include: four satellites in 600nm equatorial orbit, with potential for additional satellites in inclined orbits for polar coverage and missile tactical warning/attack assessment mission, active cryogenic cooling of LWIR focal plan detectors, [

] and five year on-orbit life. This design effort will be carried out in coordination with SBSS technology development efforts under Project 2841.

(4) Program to Completion: Prototype SBSS satellite design will be completed in early FY 86. Based on successful validation of remaining SBSS technologies and results of two contractor SBSS prototype designs, a Defense Systems Acquisition Review Council (DSARC) decision will be made to enter full-scale engineering development (FSED) of SBSS with a single contractor. Prototype development will proceed toward launch in [ ] using the Shuttle/Inertial Upper Stage launch system. This a a continuing program.

C. (U) MAJOR MILESTONES: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

PROGRAM ELEMENT (PE): #63716F
DoD MISSION AREA: #224, STRATEGIC AIR DEFENSE

TITLE: ATMOSPHERIC SURVEILLANCE TECHNOLOGY (AST)
BUDGET ACTIVITY: #3, STRATEGIC PROGRAMS

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

PROJECT NUMBER	TITLE	FY 1982 ACTUAL	FY 1983 ESTIMATE	FY 1984 ESTIMATE	FY 1985 ESTIMATE	ADDITIONAL TO COMPLETION	TOTAL ESTIMATE COST
	TOTAL FOR PROGRAM ELEMENT	N/A	N/A	11,697	0	0	11,697
2955	ARCHITECTURE DEVELOPMENT	N/A	N/A	1,697	0	0	1,697
2956	TECHNOLOGY DEVELOPMENT AND DEMONSTRATION	N/A	N/A	10,000	0	0	10,000

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Atmospheric surveillance technology is an advanced development program to conduct studies and develop an architecture for future air defense upgrades to achieve more survivable and capable surveillance systems for reliable and timely atmospheric tactical warning of air-breathing threats throughout all phases of conflict. This program also evaluates existing technology, conducts hardware fabrication, and conducts feasibility demonstrations of this hardware for application in a survivable air surveillance and defense system. [

] These programs will greatly increase deterrence of atmospheric attack against the North American continent. In addition, however, there is a requirement for a survivable North American air defense system to support U. S. needs in a trans- and post-attack scenerio. [

] This program provides the only link between advanced technology research and development projects (6.2 programs) and a future strategic defense engineering development program that will ultimately field a survivable air defense system in the mid to late 1990s. This system will be integrated with and augment our ongoing atmospheric tactical warning programs to provide full deterrence against air-breathing attack upon North America.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY ($ in thousands): Not applicable. AST is a new FY 1984 program.

4. (U) OTHER APPROPRIATION FUNDS ($ in thousands): Not applicable.

5. (U) RELATED ACTIVITIES: This concept analysis, technology development, and technology demonstration program will transition technology developed in previous and ongoing 6.2 programs to acquisition programs for systems with survivable and flexible air surveillance and cruise missile surveillance capabilities.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

PROGRAM ELEMENT: # 63716
DoD MISSION AREA: # 224, STRATEGIC AIR DEFENSE

TITLE: ATMOSPHERIC SURVEILLANCE TECHNOLOGY
BUDGET ACTIVITY: # 3, STRATEGIC PROGRAMS

6. (U) WORK PERFORMED BY: This work will be managed by Air Force Systems Command; Electronic Systems Division, Hanscom AFB, MA; and Rome Air Development Center (RADC), Griffiss AFB, NY.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

(U) 2955 Architecture Development. The purpose of this project is to develop a system architecture for a survivable air surveillance and defense system. The architecture development will consider pre-, trans-, and post-attack operational requirements and will evaluate the use of ground, air and space-based elements. In the pre-attack phase of conflict, architecture development will concentrate on proliferated surveillance/warning against air breathing penetrators. In the trans-attack phase, the concentration will be on survivable surveillance capabilities to support battle management and handoff to any engagement element. For post-attack, reconstitution capability will be a prime consideration. The architecture development project will consider integration with existing and development phase atmospheric warning and C^3I networks. Cost and capabilities analyses will be accomplished under this project to identify systems meeting survivable air defense requirements for the least cost. This project will be accomplished in parallel and will be continuously interfacing with the Technology Development and Demonstration project.

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) PROJECT: 2956 Technology Development and Demonstration.

A. (U) Project Description: This project is planned as a system-level follow-on to 6.2 programs for survivable, flexible air surveillance and cruise missile surveillance and will demonstrate applications of technology developed in these programs. This project will conduct technology validation and utility appraisal for pre-, trans-, and post-attack phases of conflict for an architecture integrating ground, air and space surveillance elements. Hardware design and fabrication will be done. Planned experiments include: single target detection and tracking tests, multiple target tests, and reconstitution tests. This project will be accomplished in parallel and will be continuously interfacing with the Architecture Development project.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Technology Development and Demonstration is a new project for FY 1984.

(2) (U) FY 1983 Program: Technology Development and Demonstration is a new project for FY 1984.

(3) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Available technology will be evaluated against current and projected advance technology air breathing threats and its utility assessed for application to a survivable air defense system for all phases of conflict. [

FY 1984 RDT&E DESCRIPTIVE SUMMARY

PROGRAM ELEMENT: # 63716
DoD MISSION AREA: # 224, STRATEGIC AIR DEFENSE

TITLE: ATMOSPHERIC SURVEILLANCE TECHNOLOGY
BUDGET ACTIVITY: #3, STRATEGIC PROGRAMS

Candidate technology will then be developed into hardware and demonstrated. As the technology is refined and demonstrated to be viable, it will be continuously fed back into the architecture development project. As the architecture is further defined, the technology for internetting viable technology sensors that have been incorporated into the architecture will be developed and demonstrated.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 63735F
DOD Mission Area: # 331 Strategic C^2

Title: Air Force WWMCCS Architecture
Budget Activity: # 3 Strategic Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	9,066	13,610	14,923	11,198	Continuing	N/A
2188	Air Force World Wide Military Command and Control System Systems Engineering Planning and Support	9,066	13,610	14,923	11,198	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This Air Force Worldwide Military Command and Control System (WWMCCS) Architecture program is our mechanism for ensuring that more than 80 Strategic Command, Control, and Communications (C^3) programs fit together as a cohesive whole. These efforts amount to an overall system engineering activity, in support of user needs, for: identifying interoperability and intersystem engineering deficiencies, proposing solutions for some selected current Air Force Strategic Command, Control, and Communications (C^3) systems, and conducting planning and development actions for Deputy Secretary of Defense directed WWMCCS Selected Architecture Programs.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	8,966	15,110	14,413	Continuing	N/A

Budget increases in FY 1984 are a direct result of addressing an office of the Secretary of Defense directed effort, the Secure Voice and Graphics Conferencing (SV/GC) program. The increased funding will be used to accomplish required research development, testing, and evaluation efforts associated with integrating the SV/GC capability at Air Force Sites. The Navy is the lead service for this effort.

4. (U) OTHER APPROPRIATION FUNDS: N/A

5. (U) RELATED ACTIVITIES: Air Force World Wide Military Command and Control System (WWMCCS) activities span the strategic command, control, and communications community. System engineering and analysis are initiated in support of some on-going product-oriented programs within the Air Force. These efforts are needed to integrate the various product-oriented programs/systems into the WWMCCS Warning, Display, and Command Systems. Some other specific program elements that relate to 63735F are: Command Center Processing and Display System, Program Element 12436F; Defense

Program Element: # 63735F
DOD Mission Area: # 331, Strategic C^2

Title: Air Force WWMCCS Architecture
Budget Activity: #3, Strategic Programs

Support Program, Program Element 12431F, provides the Mobile Ground Terminal (MGT) for interface with the Jam-Resistant Secure Communications (JRSC) Mobile Communications Terminal (MCT); Program Element 41115F, C-130 Aircraft, provides procurement funds to initiate the antenna hatch-cover modification (22 sets) for the Joint Crises Management Capability (JCMC) program in support of theater Commanders-in-Chief; Program Element 33605F, Satellite Ground Terminal (3080, 3300, 3400, and 3500) provide for the site preparation, interconnect operations and maintenance, and manpower of JRSC terminals at Air Force sites. JRSC is a Selected Architecture program to increase the WWMCCS survivability by providing a jam-resistant, secure satellite overlay to terrestrial communication links; MAC C^2 Upgrade, PE41840F continues the system integration and development work for MAC C^2, PE 63735F work for MAC is picked up in FY 84 by PE 41840F; Long Haul Communications, PE 33126F, provides procurement funds for Secure Voice and Graphics Conferencing (SV/GC) Program in the out years. The Air Force WWMCCS, PE63735F, will provide the indicated support to the above programs:

A. (U) Command Center Processing and Display System: Propose and assess alternative technical approaches in system upgrades and participate on the User Executive System Management Group (a forum for obtaining community agreement on analysis efforts and recommendations). Command Center Processing and Display System responsibility begins at the communications processor and continues through display generation and display devices.

B.

C. (U) C-130 Aircraft MOD: Development of the Joint Crisis Management Capability Program (hatch-cover modification).

D. (U) Satellite Ground Terminals: Provide continued Air Force architecture development and intersystem engineering to implement the Jam-Resistant Secure Communications (JRSC) Program at Air Force sites.

E. (U) MAC C^2: Provide technical support for the upgrade through FY 83.

F. (U) SV/GC: Provide integration planning for this capability at Air Force sites.

(U) All of the above tasks require systems engineering and interface definition for implementation of their programs at Air Force installations.

6. (U) WORK PERFORMED BY: The Air Force WWMCCS Program Office, Electronics Systems Division, Hanscom Air Force Base, MA, conducts 90 percent of the work in-house with MITRE-Bedford technical support. A number of small systems engineering contracts have been used for the balance of the work. Contracts have been let with the following companies: Honeywell, Phoenix, AZ; Magnavox, Torrance, CA; TRW, Los Angeles, CA; BDM, McLean, VA; Polhemus Navigation Science Corp., Essex Junction, VT; Analytic System Engineering Corp., Burlington, MA; Mitre Corp., Bedford, MA; Magnavox, Falls Church, VA; TRW, Washington, DC; System Analysis Inc., Lexington, MA.

Program Element: # 63735F | Title: Air Force WWMCCS Architecture
DOD Mission Area: # 331, Strategic C^2 | Budget Activity: # 3 Strategic Programs

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: N/A

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: 2188, Air Force Intersystem Planning and Engineering Support

A. (U) Project Decription: This project addresses two functions: intersystem engineering (Air Force generated requirements) and WWMCCS Selected Architecture implementation (Office of the Secretary of Defense directed requirements). First, this program provides for systems engineering and other technical analyses to adequately integrate and standardize systems of communications, command, and control centers and sensors for the Air Force strategic forces. The second effort of this program concerns the improvements recommended in the WWMCCS Architecture directed by the Deputy Secretary of Defense in 1976 (i.e., JCMC, JRSC and SV/GC).

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Provided technical support for the System Integration Office (SIO) for the tactical warning/attack assessment area. Identified and demonstrated a means to transfer warning data in the compressed mode and sensor to user communications impact. Also developed a baseline requirements document for upgrading the Command Center Processing and Display System and supported the development of a space defense system architecture. Completed the overall architecture and implementation plan for the Military Airlift Command, Control, upgrade. Performed requirements analysis and recommended altenatives for upgrade of the REDCOM Command Center. Developed requirements specification for repackaging Jam-Resistant Secure Communications (JRSC) terminals into Electromagnetic Pulse (EMP) hardened Mobile Communications Terminals (MCT). Finalized JRSC initial operational capability (IOC) architecture.

(2) (U) FY 1983 Program: Efforts will center on: (1) Continuation of intersystem tasks: (a) continue technical support to the System Integration Office (SIO) TW/AA improvements. (b) Strategic Forces Command, Control, and Communications - support selected tasks for improving connectivity and responsiveness of strategic forces during pre-trans-and-post attack and provide technical support for upgrade of SAC Command Center; also develop a Technical Analysis and Cost Estimate (TA/CE) for WWMCCS ADP, RDJTF and for the Air Defense Command Upgrade (Rapid Emergency Relocation (RAPIER)) - accomplish interoperability planning. (c) WWMCCS Information System - support schedule and planning efforts for Hq USAF programmatic and budgetary actions for Air Force sites only, (d) Military Airlift Command (MAC), Command and Control (C^2) Support - provide pre-acquisition technical support for implementing the MAC C^2 upgrade. (2) WWMCCS Selected Architecture Tasks: Implement the Air Force portion of the JCMC program, hatch-cover antenna modification. Resume JRSC full operational capability architecture definitions and provide planning for the secure voice and graphics conferencing, (SV/GC) capability at Air Force Sites.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: FY 1984 activities will include continuation of implementation intersystem engineering tasks (tactical warning, support to WWMCCS ADP sites, and Strategic Forces Command, Control, and Communications) and the Selected Architecture tasks (JCMC, JRSC and SV/GC).

Program Element: # 63735F

DOD Mission Area: # 331 Strategic C^2

Title: Air Force WWMCCS Architecture

Budget Activity: #3, Strategic Programs

(4) (U) Program to Completion: The Air Force WWMCCS Selected Architecture is a continuing program. Efforts will be in response to WWMCCS Architecture initiatives directed by the Office of the Secretary of Defense and Air Force Intersystem Engineering support for identifying interoperability and integration deficiencies and proposing solutions for some selected Air Force Command, Control, and Communications Systems.

C. (U) Major Milestones: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64226F
DOD Mission Area: 113 - Offensive Strike

Title: B-1B
Budget Activity: 3 - Strategic Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	471,000	753,500	749,900	491,800	437,800	3,123,000

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The B-1B is a strategic multi-role weapon system which maximizes range and payload capabilities, and is able to perform the missions of conventional bomber, cruise missile launch platform, and nuclear weapons delivery system in both the tactical and strategic roles. Production of the B-1B addresses the national requirements to increase our targeting flexibility, to redress the relative decline of our strategic capabilities, and to revitalize our strategic deterrent forces. The B-1B program will significantly enhance the manned bomber portion of the strategic TRIAD while preserving the vitally needed flexibility for nonnuclear force projection in response to unforeseen contingencies worldwide.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E (Aircraft) (64226F)	471,000	753,500	717,900	N/A	960,700	3,122,100
Procurement (Aircraft) (11126F)	1,621,900	4,033,500	6,142,100	N/A	14,618,000	26,415,500

(U) There have been four major changes in B-1B Procurement since the FY 1983 Descriptive Summary. In FY 1982, $9.9 million was reprogrammed from the B-1B Procurement account into the Industrial Preparedness program element (78011F). The reason for the reprogramming was that there was no decision on the new Long Range Combat Aircraft during the FY 1982 budget cycle, thus funds were not reserved for contingencies such as Industrial Preparedness during the FY 1982 budget formulation process. However, there was a critical need to initiate several production facility improvements in FY 1982 and funds had to be provided. This effort is clearly outside the B-1B baseline and the reprogrammed funds will be reinstated in the outyears.

(U) B-1B Procurement funds were reprogrammed into B-1B RDT&E for cruise missile integration in FY 1984. The FY 1985 and 1986 requirements for initial spares were revised and the funding was adjusted accordingly. In addition, the OSD reevaluation of the inflation indices and outlay patterns caused adjustments in the outyear funding profiles.

Program Element: 64226F
DOD Mission Area: 113 - Offensive Strike

Title: B-1B
Budget Activity: 3 - Strategic Programs

4. (U) (ER APPROPRIATION FUND: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Aircraft Procurement: Funds (11126F)	1,612,000	4,033,500	6,179,600	7,725,600	5,660,300	25,211,000
Quantities	1	7	10	34	48	100
Military Construction, Funds (11126F)	0	0	5,900	42,499	111,720	143,220

5. (U) RELATED ACTIVITIES: The aircrew training devices for the B-1B are funded outside the B-1B baseline. These devices will be developed under a separate program element for simulators, 64227F. This program will be managed by the Simulator Program Office. The Air Force anticipates the upper limit for the five B-1B weapon system trainers, two mission trainers, and support equipment will be $300 million (FY 1981$).

6. (U) WORK PERFORMED BY: The B-1B program is in the Full-Scale Development/Production phase. It is managed by the B-1B Program Office, Aeronautical Systems Division, Wright-Patterson Air Force Base (AFB), Ohio. The B-1B Program Office has overall integration responsibility for the development of the B-1B bomber.

(U) Rockwell International, North American Aircraft Operations, Los Angeles, California is the B-1B airframe manufacturer. Rockwell is responsible for achieving aircraft design integrity. Boeing Military Airplane Company, Seattle, Washington is the Avionics Subsystem Interface contractor responsible for integrating the B-1B avionics and for providing avionics equipment not furnished by the government. AIL Division, Eaton Corporation, Deer Park, New York develops and builds electronic countermeasures components for the B-1B defensive avionics system. General Electric Company, Aircraft Engine Group, Cincinnati, Ohio is responsible for the design and development of the B-1B propulsion system.

(U) Several government agencies provide specialized assistance. For example, the facilities at Holloman AFB, New Mexico are used to measure radar cross-section characteristics. The wind tunnels at the Arnold Engineering Development Center, Tennessee are used for comparative analyses. The Air Force Materials Laboratory and Air Force Avionics Laboratory at Wright-Patterson AFB, Ohio are also used in the development effort.

(U) The majority of the flight test will be done at the Air Force Flight Test Center, Edwards AFB, California, but several other Department of Defense test ranges are also used: White Sands Missile Range, New Mexico; Eglin AFB, Florida; Point Mugu Naval Air Station, California; Utah Test and Training Range, Utah; China Lake Naval Test Center, California; Nellis Range Complex, Nevada; and others.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not applicable

Program Element: 64226F
DOD Mission Area: 113 - Offensive Strike

Title: B-1B
Budget Activity: 3 - Strategic Programs

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: (64226F -- B-1B) (Single Project in Program Element)

A. (U) Project Description: The B-1B, a new long range combat aircraft, embodies current advances in aeronautical and countermeasures technology required to enhance aircraft survivability in projected high threat environments. Recent events portend an ever increasing need for a long range, large payload, flexible weapon system capable of world-wide rapid power projection. This program was mandated by Congress under Public Law 96-342, dated 8 September 1980, and fulfills the Strategic Air Command Required Operational Capability 3-66 (Revised), New Strategic Manned Bomber, dated 22 November 1978, and the Long Range Combat Aircraft Mission Element Need Statement, dated 8 June 1981.

(U) Major RDT&E activities planned for FY 1984 include: continued performance flight test with B-1A number 2, initiation of B-1A number 4 flight test, and the final assembly of B-1B number 1 in preparation for delivery.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Fixed Price Incentive Contracts for Full-Scale Development (FSD) and production of Lot I (one aircraft) with an option for Lot II (seven aircraft) were awarded to Rockwell International, Boeing and AIL. The FSD efforts consisted of general planning and design work necessary for weapon system development. Major activities in this area included: update and release of approximately 13,000 original engineering drawings and/or wiring lists to incorporate changes made in the B-1A program or changes required for new installations; design and release of approximately 5,000 new detailed drawings necessary to incorporate B-1B production designs; and engineering and fabrication work on B-1A number 2 to prepare it for flight test activities. B-1A number 4 was returned to flying status and successfully deployed to the Farnborough Air Show in September 1982. This aircraft has been returned to a nonflyable condition and is being modified at Edwards AFB, California for flight test which is scheduled to begin in FY 1984.

(2) (U) FY 1983 Program: The FY 1983 flight test activities for B-1A number 2, an instrumented prototype, include the determination of stability, control, and the vibration/acoustics characteristics of the B-1B. Major airframe development during FY 1983 includes: continuation of the Design Development Structural Tests (static and fatigue); initiation of fabrication of heavyweight landing gear test article; rerigging the flight control mechanism to correct for a potential hinge moment deficiency; and engineering and fabrication of needed modifications on B-1A number 4 in preparation for flight testing. Stress performance tests, endurance qualifications/demonstration and engine structural integrity programs will be completed on the first F101-GE-102 production engines. Additionally, the engine start system will be modified to include a cross-over system giving any one auxiliary power unit, or engine, the ability to start all four engines.

(U) The design of hardware and software as well as the redesign of the forward looking/terrain-following radar systems will be completed and integration of these systems will commence in FY 1983. In addition, the fabrication and ground testing of advanced and revised defensive avionics will be completed and installation/integration will begin.

Program Element: 64226F
DOD Mission Area: 113 - Offensive Strike

Title: B-1B
Budget Activity: 3 - Strategic Programs

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The Air Force request for the B-1B program in FY 1984 addresses the continuation of FSD activities and the initiation of flight test efforts. Major FSD efforts during FY 1984 include: structural design development and wind tunnel testing; weapons launcher development; avionics hardware fabrication, testing and integration; avionics software design, coding and testing; engine stress, performance and structural integrity qualifications; and integrated logistics support analysis/preparation. Major FY 1984 flight test activity includes: redesign, fabrication and subsystems integration and checkout of B-1A numbers 2 and 4 prior to flight test; initiation of the flight test program for B-1A number 2; and continuation of engineering, fabrication, and assembly of the first B-1B flight test aircraft.

(U) Major activities during this year include: completion of the wind tunnel testing; the continuation of offensive and defensive avionics installation, integration, and qualification; integration and checkout of Block 0 software; development/validation of Block 1 software; completion of weapons delivery system ground qualification testing; continuation of developmental testing on radome and antennas; and continuation of Integrated Logistics Support activity. Defensive system closed-loop testing at the Microwave Test Facility will begin. Physical and Functional Configuration Audits will be initiated.

(U) Other activities include: identifying spares, awarding training equipment contracts; awarding automatic test equipment contracts; planning for depot maintenance activation; testing ground support equipment; continuing the technical orders validation and verification process; and placing the majority of organizational support equipment/initial increment of intermediate and depot level support equipment on contract.

(U) The flight test of B-1A number 2 will continue with the addition of stability and control, weapons carriage, and weapons separation work. With engineering, fabrication, pyrotechnic changeout, and avionics modifications completed and installed in FY 1984, B-1A number 4 will begin its flight test program. Major flight test objectives include evaluation/flight checkout of production offensive and defensive avionics groups and aircraft development areas.

(4) (U) Program to Completion: B-1B system development will continue with major emphasis shifting to flight testing and the remaining cruise missile integration activities. Significant events during this period include: the initiation of flight testing on B-1B number 1 in March 1985; nuclear certification testing; weapon delivery and Short Range Attack Missile flight testing; terrain following/terrain avoidance verification; and the continued development/validation of Block 2 and 3 software. The activation of the first main operating base as well as delivery of organizational level support equipment, spares, maintenance training sets, and mission essential, safety verified, organizational technical orders will occur in FY 1985. The B-1B initial operational capability is projected for September 1986 when 15 B-1Bs will have been delivered to the Strategic Air Command.

Program Element: 64226F
DOD Mission Area: 113 - Offensive Strike

Title: B-1B
Budget Activity: 3 - Strategic Programs

C. (U) Major Milestones:

	Milestones	Dates
A.	(U) Defense Systems Acquisition Review Council (DSARC)	Jul 67
B.	(U) DSARC II	Jun 70
C.	(U) DSARC III	Dec 76
D.	(U) B-1A Production Cancellation	Jun 77
E.	(U) President Reagan Strategic Modernization Plan	Oct 81
F.	(U) Full-Scale Development Contract Award (Rockwell)	Jan 82
G.	(U) Full-Scale Development Contract Award (General Electric)	Feb 82
H.	(U) Engineering Review	Apr 82
I.	(U) Full Scale Development Contract Award (AIL and Boeing)	Jun 82
J.	(U) Configuration Review	Jan 83
K.	(U) OSD Program Review	Mar 83
L.	(U) B-1A number 2 Flight Test Start	Apr 83
M.	(U) B-1A number 4 Flight Test Start	Jul 84
N.	(U) B-1A number 2 Flight Test Complete	Nov 84
O.	(U) B-1B number 1 Flight Test Start	Mar 85
P.	(U) B-1A number 2 Flight Test for Cruise Missile Carriage Start	Sep 85
Q.	(U) B-1A number 4 Flight Test Complete	Jun 86
R.	(U) B-1A number 2 Flight Test for Cruise Missile Carriage Complete	Jun 86
S.	B-1B number 1 Flight Test Complete	Jun 86
T.	(U) B-1B number 9 Flight Test for Cruise Missile Carriage Start	Aug 86
U.	(U) Initial Operational Capability	Sep 86
V.	(U) B-1B number 9 Flight Test for Cruise Missile Carriage Complete	Aug 87
W.	(U) Full Operational Capability	Jun 88

Budget Activity: Strategic Programs, 3
Program Element: #64226F, B-1B

B-1B

Test and Evaluation Data

1. (U) Development Test and Evaluation: The Defense Systems Acquisition Review Council process was completed for the B-1A in December 1976. President Carter cancelled the production/deployment of the B-1A in June 1977.

(U) In July 1980 the United States Congress directed the Department of Defense to vigorously pursue the full-scale engineering development of a multirole bomber with an initial operational capability no later than 1987. As a result of that direction, a Joint Air Force/Office of the Secretary of Defense (OSD) Bomber Alternatives Study team evaluated advanced technology aircraft, the B-1 bomber aircraft and derivatives of the B-1 aircraft, and FB-111B/C aircraft.

(U) The General Electric Company was awarded an Initial Full-Scale Development (IFSD) contract for engines in February 1981. These engines were common to the aircraft being evaluated by the Joint Air Force/OSD Bomber Alternative Study team.

(U) On October 2, 1981 President Reagan announced his decision to build 100 B-1Bs. Rockwell International Corporation, Boeing Military Airplane Company, and AIL Division of the Eaton Corporation were awarded their IFSD contracts in October 1981. Subsequent Full Scale Development (FSD) contracts were awarded to Rockwell in January 1982 and to General Electric in February 1982. Boeing and AIL received their FSD contracts in June 1982.

(U) The B-1B program is managed by the B-1B Program Office. This program is a continuation of the original B-1A effort. Approximately 90 percent of the B-1A airframe testing was accomplished during the original 6 years of flight test. The B-1B offensive and defensive avionics suites will require additional flight test. Examples of this testing include: examination of the coverage of the ALQ-161 defensive suite, B-52/B-1B Offensive Avionics System integration, and an evaluation of the terrain following/forward looking radar, and the inertial navigation system.

(U) The B-1B baseline test and evaluation program contains 57 months of Development Test and Evaluation/Initial Operational Test and Evaluation flight test. B-1A number 2, a fully instrumented prototype, will be used for stability and control, vibration/acoustics, dynamic response, propulsion, flutter, and weapon carriage and separaration tests starting in April 1983.

(U) B-1A number 4, which was deployed to the Farnborough Air Show in September 1982, will be modified with the complete offensive and defensive systems groups. This aircraft will be used for heavyweight buildup, offensive and defensive avionics integration and terrain following evaluation beginning in July 1984.

(U) Beginning in March 1985, the first production B-1B will be used for flutter, stability and control, performance and weapons separation testing. This aircraft will be delivered to the Strategic Air Command after completion of its portion of the flight test.

Budget Activity: Strategic Programs, 3
Program Element: #64226F, B-1B

(U) The majority of the flight tests will be done at the Air Force Flight Test Center, Edwards Air Force Base, California, but several other Department of Defense test ranges will also be used: White Sands Missile Range, New Mexico; Eglin Air Force Base, Florida; Point Mugu Naval Air Station, California; Utah Test and Training Range, Utah; China Lake Naval Test Center, California; Nellis Range Complex, Nevada; and others.

(U) A Program Management Plan Executive Summary for the B-1B program was prepared and submitted to the Deputy Secretary of Defense. The Strategic Air Command System Operational Concept was published in October 1982. A Decision Coordinating Paper and Integrated Program Summary have been submitted to the Office of the Under Secretary of Defense for Research and Engineering for review and approval. A Test and Evaluation Master Plan with associated schedules, milestones, cost estimates, and thresholds will be submitted to Office of the Secretary of Defense in December 1982.

(U) The Reliability and Maintainability effort will be directed towards use of a stringent Parts Control Program, Reliability Development/Growth Testing, Burn-In Under Environmental Stress of all production lots, and Reliability Qualification/Production Reliability Tests for selected reliability of safety critical equipment.

2. (U) Operational Test and Evaluation (OT&E): The Air Force Test and Evaluation Center (AFTEC) conducted Initial Operational Test and Evaluation will assess the operational effectiveness and suitability of the B-1B. Operational issues and test objectives have been identified by AFTEC with the assistance of the Strategic Air Command, for the total OT&E program consisting of combined Development Test and Evaluation/Initial Operational Test and Evaluation (DT&E/IOT&E) and Follow-on Test and Evaluation (FOT&E). Those OT&E objectives not sufficiently addressed during the combined DT&E/IOT&E will be address during FOT&E.

(U) The OT&E evaluation will use all applicable B-1A test data to evaluate the B-1B. Operational suitability testing will begin during the combined DT&E/IOT&E and will extend into Follow-on Test and Evaluation since some support equipment will not be delivered until late in the combined DT&E/IOT&E Test Program.

(U) The areas of special interest in B-1B OT&E testing will be navigation reliability and accuracy, low level penetration capability, survivability, weapons delivery, sortie generation capability, mission reliability, and diagnostic capability.

(U) Many of the data from the B-1A DT&E/IOT&E flight test are directly transferrable to the B-1B and will not have to be reevaluated. However, some deficiencies identified in the B-1A DT&E/IOT&E have been corrected in the B-1B and will be reexamined: horizontal stabilizer hinge moment, engine nozzle design, pitch trim rate, flap/slat system, engine start system, flight control non-linear gearing, overwing fairings, inertial navigation system, weapon bay door acoustics and vibration, central integrated test system, and fuel leaks.

Budget Activity: Strategic Programs, 3
Program Element: #64226F, B-1B

(U) The Program Management Directive and the Test and Evaluation Master Plan will specify the Operational Test and Evaluation (OT&E) responsibility of Air Force Test and Evaluation Center (AFTEC), Strategic Air Command, Air Force Logistics Command, Air Force Systems Command, and Air Training Command.

(U) OT&E Reports Published:

(1) (U) HQ AFTEC, B-1 IOT&E Final Report, March 1977 (Secret).

(2) (U) HQ AFTEC, Manned Bomber Penetration Evaluation Final Report, 30 June 1981, (Secret).

3. (U) Systems Characteristics: The B-1B contract specifications have been negotiated. System parameters will be demonstrated during the 57 month Development Test and Evaluation/Initial Operational Test and Evaluation flight test.

Characteristic	Goals	Thresholds	Current Estimate
(U) Technical:			
1. (U) Weight empty	186,000 lbs	188,000 lbs	184,350 lbs
(U) Operational:			
1. (U) Takeoff distance (Standard day, sea level)			
Design gross weight (395,000)			
Maximum gross weight (477,000)			
2. (U) Sustained speed (Design Mach number)			
(U) High altitude	0.70 Mach	0.70 Mach	0.70 Mach
(U) Penetration altitude	0.85 Mach	0.85 Mach	0.85 Mach

Budget Activity: Strategic Programs, 3
Program Element: #64226F, B-1B

Characteristic	Goals	Thresholds	Current Estimate
3. (U) Range			
Penetration mission 1/			
Conventional mission 2/			
4. (U) Payload			
(U) SRAM (Internal)	24	24	24
(U) ALCM-B (Internal/external) 3/	8/14	8/14	8/14
(U) MK-82 (Internal)	84	84	84
(U) B61 (Internal)	24	24	24
(U) Maintainability/Reliability			
1. (U) Maintainability (Maintenance Manhours/Flying Hours)			
(U) B-1B Systems	37.6	37.6	37.6
(U) Airframe			24.1
(U) Engine			2.2
(U) Offensive Avionics 4/			1.9/2.2 hr
(U) Defensive Avionics 4/			0.75/ - hr
2. (U) Reliability (Mean Time Between Maintenance)			
(U) B-1B System			1.0 hr
(U) Airframe			1.22 hr
(U) Engine			58.3 hr
(U) Offensive Avionics			13.0 hr
(U) Defensive Avionics			18 hr

1/

2/

3/ (U) ALCM carriage will comply with appropriate Arms Limitation Agreements.

4/ (U) Hour Mean Time to Repair

Budget Activity: Strategic Programs, 3
Program Element: #64226F, B-1B

Characteristic	Goals	Thresholds	Current Estimate
3. (U) Mission Completion Success Probability			
(U) B-1B System			0.92
(U) Airframe			0.977
(U) Engine			0.996
(U) Offensive Avionics 1/			0.949
(U) Defensive Avionics 1/			N/A

1/ (U) Mean Time Between Failures

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64233F
DOD Mission Area: 140, Strategic Support

Title: Tanker, Transport, Bomber, Training System (TTBTS)
Budget Activity: 3, Strategic Programs

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	-0-	-0-	1533	5674	4733	11,940

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Tanker-Transport-Bomber (TTB) aircraft was validated by Air Training Command General Operating Requirement 01-78 and is required to enable Air Training Command to implement Specialized Undergraduate Pilot Training (SUPT). The TTB will be an off-the-shelf, twin-engine aircraft which will be used to conduct the basic phase of pilot training for students selected for operational assignment to tanker, transport, or bomber aircraft.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	0	560	1557		TBD	TBD
Procurement			4600		TBD	TBD
Quantities			(1)			

EXPLANATION OF CHANGES

- FY 1983 RDT&E funds were deleted by the Authorization Conference Committee without explanation
- FY 1984 Procurement Funds were deleted because the IOC was slipped from FY 86 to FY 88

4. (U) OTHER APPROPRIATION FUNDS ($ in thousands):

	FY 1982	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Aircraft Procurement	-0-	-0-	-0-	15,900	2,030,100	2,046,000
Quantities				1	224	225

Program Element: # 64233F
DOD Mission Area: 140, Strategic Support

Title: Tanker, Transport, Bomber (TTB)
Budget Activity: 3, Strategic Programs

5. (U) RELATED ACTIVITIES: None.

6. (U) WORK PERFORMED BY: The Tanker, Transport, Bomber, Training System (TTBTS) aircraft test program will be managed by Air Force Systems Command/Aeronautical Systems Division, Wright-Patterson Air Force Base, Ohio. The Air Force Test and Evaluation Center (AFTEC) will manage the Operational Test and Evaluation (OT&E) of the TTB Trainer Aircraft that is to be developed and acquired to implement the Air Training Command's (ATC) Specialized Undergraduate Pilot Training (SUPT) Program. A Request for Information (RFI) was released to industry on 30 Sep 81 and responses were received in Dec 1981.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

(U) PROJECT: Tanker, Transport, Bomber (TTB)

A. (U) DETAILED BACKGROUND AND DESCRIPTION: The Tanker-Transport-Bomber (TTB) aircraft, validated by ATC GOR 01-78, is required to enable Air Training Command to implement Specialized Undergraduate Pilot Training (SUPT). The training provided with a TTB aircraft will improve the quality of TTB pilot graduates, result in lower operational training costs, and will delay T-38 fleet insufficiency to beyond the year 2000. An IOC (36 aircraft) in 1988 is required by Air Training Command. The TTB will be an off-the-shelf, twin-engine aircraft which will be used to conduct the basic phase of pilot training for students selected for operational assignment to tanker, transport, or bomber aircraft. It will have a high level cruise capability of 0.7M, a low level speed of at least 300KTS, seating for two student and one instructor, and a 3 hour mission profile with divert capability.

(U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1982 Accomplishments: Responses to the RFI were received from ten companies in the first quarter of FY 1982. The Air Force decided to slip the IOC from FY 1986 to FY 1988.

2. (U) FY 1983 Program: A Request for Proposal for Full Scale Development will be released in the Fall of 1983. Contract award is planned for the third quarter of 1984.

3. (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: FY 1984 funds will be used to conduct Source Selection and award a Full Scale Development contract. The engineering effort for the necessary modifications to include avionics integration and the third aircrew member station will begin. The major proportion of the program costs were based on commercial and Government Furnished Equipment price lists. Historical and analogous program factors were used for data, peculiar support equipment, and training.

Program Element: # 64233F
DOD Mission Area: 140, Strategic Support

Title: Tanker, Transport, Bomber (TTB)
Budget Activity: 3, Strategic Programs

4. (U) Program to Completion: The engineering effort on the necessary modifications will continue until FY 1986. Testing will begin on the first aircraft that includes the modifications. Durability and Damage Tolerance Assessment on the engine will begin in FY 1985 and continue until FY 1987. The Initial Operational Capability is 36 aircraft and two simulators in FY 1988.

C. (U) MAJOR MILESTONES:

MILESTONE		DATES
1. ATC GOR 01-78 Validation		Apr 79
2. TTB MENS Approved		Nov 81
3. Release RFI		Sep 81
4. Systems Program Office Established		Oct 81
5. Release RFP	*(Oct 82)	Oct 83
6. Milestone I/II	*(Jul 83)	Jan 85
7. IOC (36 aircraft)	*(Jul 86)	Spring 88

(U) Explanation of Milestone Changes:

- *Milestone changes are due to the decision to change the IOC from FY 86 to FY 88.

Program Element: 64233F Tanker, Transport, Bomber (TTB) Trainer Aircraft

Test and Evaluation Data

1. (U) Development Test and Evaluation: The Tanker, Transport, Bomber, Training System (TTBTS) aircraft test program will be managed by Air Force Systems Command/Aeronautical Systems Division, Wright-Patterson Air Force Base, Ohio. A comprehensive integrated test and evaluation program will be planned and accomplished on the TTBTS to support development efforts, establish capabilities with respect to design requirements, and determine operational effectiveness and suitability. These test results will provide data which, when combined with other program inputs, will form the basis for a Milestone III production decision.

(U) A combined Development Test and Evaluation/Initial Operational Test and Evaluation (DT&E/IOT&E) program is planned in which both contractor and Government test requirements will be incorporated in an integrated test plan. A combined test force will be used for DT&E/IOT&E flight testing. Aircrews will be mixed Air Force and contractor, with an Air Force Pilot in one or both of the pilot seats for all test flights. Maintenance crews will consist of both Air Force and contractor personnel.

(U) The TTBTS shall consist of off-the-shelf equipment. Substantial development testing has been conducted by some of the potential contractors. Contractor responses to a request for information issued in September 1981 should provide specific testing accomplished. This information will be updated prior to Milestone II.

(U) Ground testing will be conducted to verify design and minimize risks. Flight testing will be conducted to verify design, and assess system effectiveness and suitability.

(U) System components, specimens, and aircraft will participate in DT&E. Two instrumented aircraft are planned to participate in the combined flight test program.

(U) The primary objective of DT&E is to evaluate and verify that the design of the TTBTS is in compliance with the requirements as stated in the contractual specifications.

2. Operational Test and Evaluation (OT&E): The Air Force Test and Evaluation Center (AFTEC) will manage the OT&E of the Tanker, Transport, Bomber (TTB) Trainer Aircraft that is to be developed and acquired to implement the Air Training Command's (ATC) Specialized Undergraduate Pilot Training (SUPT) Program. The TTB aircraft is expected to be a modified, off-the-shelf multiengine aircraft that will be used to produce pilots with basic flying skills for performing tanker, transport, and bomber operational missions.

(U) IOT&E, scheduled from 1 Jan 86 - 30 Jun 86, will assess the following operational areas:

(U) Operational performance of the TTB aircraft.

Program Element: 64233F Tanker Transport Bomber (TTB) Trainer Aircraft

(U) Capability of the TTB aircraft, with ancillary support, to effectively satisfy the tanker, transport, bomber training requirements of the Specialized Undergraduate Pilot Training (SUPT) program.

(U) Availability of the TTB aircraft (including reliability) to satisfy the Air Training Command's (ATC) SUPT training requirements.

(U) Operational maintainability and logistics supportability of the TTB aircraft.

(U) Initial testing is planned to be accomplished under a combined development test and evaluation/initial operational test and evaluation concept at Edwards Air Force Base, California. In addition, Operational Test and Evaluation is planned to be conducted in a realistic operational environment (i.e., deployment to an operational ATC base (to be determined) where typical TTB training missions will be flown and Air Force "hands-on" maintenance will be accomplished to the maximum extent feasible). The Initial Operational Test and Evaluation test team will consist of personnel from Air Force Test and Evaluation Center (AFTEC), ATC, Air Force Logistics Command (AFLC) and the Air Force Human Resource Laboratory. Test aircraft are expected to be preproduction versions of the TTB.

3. (U) System Characteristics: The significant performance parameters that will allow the Tanker, Transport, Bomber Training System to support training in the Specialized Undergraduate Pilot Training role are shown below.

CHARACTERISTIC	OBJECTIVE	DEMONSTRATED
Aircraft General	Multi-engine	To be determined
	Weight/Volume capability for for 3-man crew (2 student pilots, 1 instructor pilot), individuals gear, all necessary subsystems to meet mission requirements	To be determined
	Bird resistant windscreen at maximum low level speed	To be determined
Endurance	3 hour training mission (2 hours low level) plus divert 300 Nautical Miles land wit. fuel reserve	To be determined
Fatigue Life	18,000 hours	To be determined.

Program Element: 64233F Tanker Transport Bomber (TTB) Trainer Aircraft

CHARACTERISTICS	OBJECTIVE	DEMONSTRATED
Flight Characteristics	Yoke configuration and throttles similiar to large aircraft Stressed for low altitude/high speed flight Cruise Speed*	To be determined
Powerplant:	State of the art, fuel efficient, 8000 feet critical field length Take off from 4000 feet Pressure Altitude (PA) Cruise Speed* Speed at 500 feet above ground level (AGL)*	To be determined
Avionics	The aircraft is expected to have installed, as a minimum, the following avionics: Tatical Air Navigation (TACAN) with air-to-air capability Variable Omni Range (VOR) Instrument Landing System (ILS)/marker beacon Interphone panels at crew stations Very High Frequency (VHF) radio Inertial Navigation System (INS) (desired) Identification Friend or Foe (IFF) Weather radar with beacon capability Ultra High Frequency (UHF) radio with Automatic Direction Finding (ADF) capability Radar altimeter Radar beacon	To be determined

(U) The aircraft is to be used as a trainer for pilots selected to fly tanker, transport, and bomber aircraft. The aircraft will be operated at approximately ** knots at 500 feet AGL with pop-up for air drop training. The aircraft is expected to be operated at 5000 feet or below for 62% of the mission flight time (excludes divert time).

Program Element: 64233F Tanker Transport Bomber (TTB) Trainer Aircraft

the time at low altitude, approximately 20% of the time will be at 250 knots or faster. The aircraft is expected to average three landings per flight hour. The aircraft will be subjected to frequent bird strikes at speeds of up to ** knots, to gust loading at low altitude high speed and to "g" loading for both terrain avoidance and pop-up maneuver.

(U) *The Air Force has not established the cruise speed requirement. Use long range cruise and high speed cruise if .7 Mach or greater, and use speed attained with maximum continuous power if below .7 Mach.

(U) **The Air Force has not established the speed requirement. Assume the requirement is either 300 knots or maximum speed attainable at maximum continuous power if aircraft will not achieve 300 knots.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64312F
DOD Mission Area: Land-Based Strike, #111

Title: Peacekeeper
Budget Activity: Strategic Programs, #3

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	1,899,740	2,505,762	3,378,389	2,901,183	TBD	TBD

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The requirement for Peacekeeper is a function of the need to respond to current and projected Soviet advanced ICBM developments. This will require a high degree of survivability. Further, the current ICBM systems are somewhat deficient in the measures of flexibility which will be required in the 1980s to maintain a high level of deterrence across the entire spectrum of potential response. The pace and scope of Soviet ICBM developments will result in a destabilizing imbalance between U.S. and Soviet strategic capability in the mid-1980s. Peacekeeper deployment is needed to alleviate this predicted asymmetry. The objective of this program is to develop an advanced, Multiple Independently Targetable Reentry Vehicle Intercontinental Ballistic Missile (ICBM), Peacekeeper. The basing subsystems options include hardened silos located at Warren Air Force Base, WY, launch control and electronic power equipment, and mechanical hardware to support transportation and handling of the booster stages and the reentry system.

Program Element: #64312F
DOD Mission Area: Land-Based Strike, #111

Title: Peacekeeper
Budget Activity: Strategic Programs, #3

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
RDT&E	1,963,157	2,759,332	2,651,476		TBD	TBD
Aircraft Procurement					TBD	TBD
Missile Procurement		1,497,100	3,199,428		TBD	TBD

Explanation of funding differences:

RDT&E: Decreases in FY 82 and FY 83 are due to Congressional reductions. Increase in FY 84 is due to program redirection as announced by the President in November 1982.

Missile Procurement: FY 83 funding deleted by Congressional action, however, a supplemental will be submitted to restore the FY 83 requirement consistent with a CSB deployment.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

Program Element 11215F (Peacekeeper Squadrons)

Military Construction	11,000	16,700	390,000	640,643	TBD	TBD
Aircraft Procurement					TBD	TBD
Missile Procurement			2,867,858	4,015,147	TBD	TBD

Program Element: #64312F
DOD Mission Area: Land-Based Strike, #111

Title: Peacekeeper
Budget Activity: Strategic Programs, #3

5. (U) RELATED ACTIVITIES: This program is directly related to the results of efforts in the Advanced ICBM Technology Program (PE 63305F), M-X Squadrons (PE 11215F), and Advanced Strategic Missile Systems (PE 63311F). This program and the related programs are all managed within the Ballistic Missile Office, and thus close coordination is assured. PE 11215F contains the funding for both M-X military construction and missile procurement.

6. (U) WORK PERFORMED BY: The program is managed by the Ballistic Missile Office, Norton Air Force Base, CA. Testing facilities at Arnold Engineering Development Center, Tullahoma, TN, will be used for motor testing. Contractors include: Thiokol, Brigham City, UT; Aerojet General, Sacramento, CA; Hercules, Magna, UT; Rocketdyne, Canoga Park, CA; Autonetics, Anaheim, CA; Northrop, Hawthorne, CA, and Norwood, MA; Honeywell, St Petersburg, FL; Charles Stark Draper Lab, Cambridge, MA; Logicon, Torrance, CA; Westinghouse, Sunnyvale, CA; AVCO, Lowell, MA; Martin Marietta, Denver, CO; TRW, Ballistic Missile Division, Norton AFB, CA; Boeing, Seattle, WA; GTE Sylvania, Needham, MA; and General Electric, Philadephia, PA.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: N/A

8. (U) PEACEKEEPER (SINGLE PROJECT OVER $10 MILLION IN FY 1984):

A. (U) PROJECT DESCRIPTION: The M-X missile system entered full scale development in September 1979. In October 1981, the President redirected the program by cancelling the Multiple Protective Shelter basing mode and directing development of the silo basing concept for initial M-X deployment. In addition, research and development on survivable basing candidates was directed. Congress directed further study of Peacekeeper basing in the FY 83 Continuing Resolution. The President formed a Commission of Strategic Forces chaired by Dr. Scowcroft to review strategic force modernization with special focus on ICBMs. The President is planning to report his decision to Congress on 1 March 1983. The major areas of effort are development of missile and basing subsystems, system integration and extensive system/subsystem testing to support the production decision. The missile subsystems are and will continue to be operational designs of the preprototype hardware developed in the Advanced ICBM Technology Program (Program Element 63305F). The missile subsystems will include an advanced guidance set derived from the Advanced Inertial Reference Sphere prototype. The three booster stages will contain an advanced solid propellant and lightweight motor cases and advanced nozzles which will produce about twice the propulsion efficiency of current ICBM systems. The M-X Post Boost Vehicle, although significantly larger than that of Minuteman, will use a similar, well proven configuration. The M-X reentry vehicle will be the Advanced Ballistic Reentry Vehicle (ABRV).

Program Element: #64312F
DOD Mission Area: Land-Based Strike, #111

Title: Peacekeeper
Budget Activity: Strategic Programs, #3

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) (U) FY 1982 and Prior Accomplishments: Most of the FY 1982 RDT&E request was in support of missile development to include: propulsion stages; reentry system; guidance and control hardware and software; missile handling and transportation equipment; instrumentation and flight safety system; training equipment; data collection and evaluation; and general engineering support. The basing development included design, fabrication and test of: transporter-launcher vehicles; command, control and communications systems; ground power; physical security hardware and software; countermeasure techniques and equipment; environmental systems; targeting software, shelter closure development; facilities development; and environmental assessment. In addition, nuclear hardness and survivability testing was conducted, as well as basing tests and flight test preparation. Full scale development efforts continued on missile and basing subsystems, to include continued and refined design, fabrication and testing of the M-X missile.

(U) The training equipment and course work were developed for use by Strategic Air Command and Air Training Command personnel to train the operational and maintenance users. Design and fabrication of the missile and its launch canister proceeded through integration testing. First flight hardware was delivered and flight proof testing of the instrumentation flight safety system was begun. The Vandenberg AFB flight test pads went through assembly and check out. Complete system integration testing began at Vandenberg AFB. Thrust vector control and stage destruct testing was accomplished at Arnold Engineering Development Center. Concept validation efforts were initiated on the Deep Basing concept.

(2) (U) FY 1983 Program: Weapon system full scale development will continue. There will be a critical design review on each of the missile's four stages leading to a first flight in 1983. Flight hardware for the guidance and control system will be delivered. The inertial measurement unit will complete its critical design phase and the entire reentry system will go through integration and testing. There are five test flights scheduled from Vandenberg AFB and Defense System Acquisition Review Council III is scheduled for mid-CY 1983. The Vandenberg AFB support equipment delivery will be completed. Research and development will continue on the Deep Basing concept.

Program Element: #64312F
DOD Mission Area: Land-Based Strike, #111

Title: Peacekeeper
Budget Activity: Strategic Programs, #3

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Fabrication and testing will be continued on all the major missile and basing subsystems. This will include the three booster motors (Stages I, II, and III), the post-boost vehicle, guidance and control, reentry system, missile transportation and handling equipment, and flight safety system. The basing vehicle subsystem will continue testing. Flight and targeting software design will be continued. Extensive flight and ground test planning and special test-unique hardware design will be fabricated. The research and development concept validation effort will continue for the long-term basing option of Deep Basing. There will be 4 test launches from Vandenberg AFB. Production will begin on the missile and basing hardware.

(4) (U) Program to Completion: Peacekeeper system development will continue with the emphasis shifting to flight testing and baselining the final Peacekeeper system design. The basing system Initial Operational Capability is late 1986 and the Research, Development, Test and Evaluation projection shows that FY 1987 will be the last year requiring Research and Development funds.

C. (U) Milestones:

	Date
1. Missile System Design Review	Feb 80
2. Basing Full Scale Development	Apr/May 82
3. First Flight	See Note
4. Production Start	Oct 1983
5. IOC	Dec 86

NOTE: Congress has delayed the first flight until both Houses agree on a permanent basing mode. As this is not expected to occur until mid-April 83, the missile will be ready for first flight and can be flown very soon after the decision.

Peacekeeper Test & Evaluation Data

1. Development Test and Evaluation Data

(U) The Ballistic Missile Office (BMO), Norton AFB, CA, is the Air Force Systems Command Program Manager for developing the M-X Weapon System. BMO is also the Responsible Test Organization for DT&E. The Air Force Test and Evaluation Center (AFTEC) is responsible for Independent OT&E. The Strategic Air Command (SAC) will operate the M-X and will, jointly with the Air Force Logistics Command (AFLC), be responsible for maintaining the system. Principal development contractors are: Aerojet General Corp., AVOE, General Telephone Equipment-Sylvania, Hercules Aurospace Corp., Martin Marietta Corp., Rockwell International-Aetonetics Div, Rockwell International Rocketdyne Div., TRW, the Boeing Company, Thiokol Corp., and Westinghouse Electric Corp.

(U) The DT&E program to date has concentrated primarily on the development and test of missile subsystems with the first flight test scheduled for early 1983. Testing of basing systems concepts for CSB will commence with go-ahead on the CSB program.

(U) DT&E testing reported herein summarizes activity leading toward the first flight test in early 1983.

(U) The test data thus far has provided confidence that the required weapon system performance can be met within the identified state-of-the-art technologies at a reasonable cost. Additionally, this testing has provided hardward design data that will assure more comprehensive specifications and a more realistic estimate of life cycle system cost. The test program initially evaluated areas of design risk in guidance, motor and nozzle, reentry system, launcher, C^3, ground power, physical security system, and nuclear hardness and survivability. Contractor test facilities, the Arnold Engineering and Development Center at Tullahoma, Tennessee; the Rocket Propulsion Lab at Edwards Air Force Base, California; the Nevada Test Site, Mercury, Nevada, Holloman AFB, New Mexico, and Vandenberg Air Force Base (VAFB), California have been used for most of the testing to date.

(U) DT&E during Full-Scale Development is currently emphasizing testing of components and subsystems to design and development requirements. All of the airborne vehicle equipment (AVE) hardware supplied by the guidance and control (G&C) contractor for the ground test missile (Pathfinder) testing, which precedes the first flight test missile (FTM), has been delivered. The Missile Guidance and Control Set (MGCS) for Pathfinder is the first guidance drawer to undergo full acceptance testing and delivery to the Government for M-X use. A large quantity of VAFB unique G&C software has also been delivered to support Pathfinder processing and missile level tests.

(U) Stage I and the flight termination ordnance system (FTOS) for the first flight test missile (FTM-1) have been delivered to VAFB. The other stages the and reentry system will be delivered by mid-October. The in-plant integration test program involving the G&C subsystem and other missile subsystems was completed in September.

The integration testing culminated with a Terminal Count Down (TCD) and simulated flight during which the MGCS was operated using the AVE power system (flight batteries) and the in-flight coolant assembly. First flight software is being qualified. Calibration and alignment testing is in progress. The MGCS for FTM-1 support is scheduled for delivery 5 November 1982.

(U) Full-Scale Upper Stage motors were tested, including high expansion ratio, extendible nozzle exit cones, high strength, lightweight Kevlar motor cases, high performance Class 1.3 propellants in Stages I and II and Class 1.1 propellant in Stage III. Warm gas control generator and composite shim flexseal movable nozzle joints were tested and are capable of high angle, duration. Motors on Stages II and III demonstrated the feasibility of deploying a full-scale extendible nozzle exit cone over the plume of M-X motors, and the ability to design an extendible nozzle exit cone to withstand the particle impingement incident to high expansion ratio nozzles. Test results indicate that M-X performance can be achieved by using demonstrated state-of-the-art technology even though in-flight environments have not yet been tested. Carbon-carbon integral throat-entrance components have been manufactured for Stage I, II, and III. Carbon-carbon fixed nozzle liners (used only on Stage III) have been manufactured and verified during testing.

(U) Total full-scale successful sea level firings to date include: six Stage II and four Stage III. All of the motor firings were considered successful in achieving their designated test objectives. In addition to the completed sea level tests, M-X Stage II, III, and IV motors have also been subjected to testing at AEDC under simulated altitude conditions. Total full-scale successful altitude tests at AEDC include four Stage II, five Stage III and six Stage IV. Testing of developmental motors on the M-X program will be completed with the firing of Stage IV. To date, motor testing under simulated altitude conditions has been successful in achieving the designated test objectives with the exception of the first ENEC test on Stage II which failed due to excessive erosion. On all stages, initial flight type motors have been tested successfully, thus providing the confidence to proceed with the Flight Proof Test (FPT) program. The FPT Program is designed to qualify the full-up flight configuration and is scheduled to begin in mid October 1982 for Stages I, II and IV. Stage III FPT motor program is in progress. Completion of the FPT Program will support first flight.

(U) The M-X command destruct motors for Stages I and III were successfully tested at the AFRPL testing grounds in early April and mid-March, respectively. The purpose of the test was to demonstrate that the Flight Terminatio Ordnance System (FTOS) ordnance would fully terminate the motor firing without causing detonation of the propellant. The Stage II command destruct motor test (CD-1) was attempted at Edwards AFB, but failed 310 milliseconds after motor ignition due to an over-pressurization of the case. The test was intended to activate the FTOS 2.5 seconds after motor ignition to verify FTOS operation. However, due to the motor failure, the test of the FTOS was precluded. The failure review team has concluded that the CD-1 motor failure was caused by "unzipping" of the forward boot causing unplanned increase in propellant burn surface area. Corrective action has been implemented at Aerojet to prevent any further occurance of this failure.

(U) Reentry System fit checks with internal components and with the Fourth Stage have been completed. Both the MK-12A Reentry Vehicle which will be used on the first five flights and the Advanced Ballistic Reentry Vehicle, designated MK 21, can be accommodated on the deployment module. The assembled system has been subjected to simulated flight vibration and ordance induced shock testing. All responses were within design limits. A successful shroud fly-away test was conducted at Otis AFB, MA, in December 1981.

(U) A full scale development and evaluation test series began in January 1982 on the canister assembly at the Nevada Test Site. this initial series of the Canister Assembly Launch Test Program (CALTP) consisted of four test vehicle launches and has identified problems with canister-to-missile pads sticking to the missile and possible pad recontact with the missile. This testing has resulted in improved design of the Launch Eject Gas Generator (LEGG), confirmation of the redesign of the Missile Umbilical Group (MUG), which employed a lanyard, and examination of designs to resolve the problem of pads sticking to the missile. The goal of the future tests (weapons system test T-14 and a proposed second series of CALPT) is to determine: canister-to-missile separation ordnance shock, the effect of steam on the Stage I aft end hardware during ejection, the steam pressure and moisture environment in the internal portion of the Stage I motor, incanister launch dynamics and exit tip-off rates. Test T-14, scheduled in October 1982, will be the final confirmation of ejecting dynamics prior to first flight. The test will be performed using a Thiokol Stage I with an inert propellant and canister hardware representative of that which will be utilized with FTM-1.

(U) M-X components and materials have been tested in the continuing DNA sponsored nuclear underground tests. The first test on the complete missile will be the Electromagnetic Pulse (EMP) Allocations Test (T-21) to be conducted in the ARES facility, Kirtland Air Force Base, during the months of January through June 1983. The dielectric (wood) test stand is under construction at the ARES facility. The stand will be ready to support testing in early November. Missile components and handling equipment will be received in November. Assembly is scheduled for completion in December. Testing will be conducted between January and June 1983. Each phase of flight will be tested separately since each stage has its own response to the EMP/SGEMP threat.

(U) A full scale, flight weight inert M-X missile was tested in the Missile Modal Survey Test (T-13) in April 1982). This test was conducted to define the structural dynamic characteristics of the missile. The missile bending modes, mode shapes and structural damping were determined from tests of two missile configurations; i.e., Stage I at lift-off and Stage I at burnout. Based on the information derived from these tests, the missiles dynamics have been sufficiently characterized to begin flight testing.

(U) Twenty test flights from the Western Test Range at Vandenberg Air Force Base, California have been scheduled beginning in early 1983. These flight tests will begin during Development Test and Evaluation/Initial Operational Test and Evaluation and continue through a Follow-on Test and Evaluation. The flight test articles will be configured with test reentry vehicles and an in-flight safety system. The Test and Evaluation objectives are to: evaluate M-X Stage II and III motor extendable nozzle exit cone capability to survive and perform during actual M-X missile powered flight; assess the capability of the Advanced Inertial Reference Sphere Guidance and

and Control units to achieve accuracy and reliability, including ground system interface, stage performance, guidance and control accuracy, reentry system footprint, and time of flight performance capabilities. Initial launches will be from a test pad to evaluate the missile.

(U) Corrective action for the sticking pads consisted of redesign of the pads and removal of pads from Stage III. Testing of four different pad configurations including ones with mylar film and waffle type construction have been accomplished. During the last CALTP launch all of the waffle type pads released satisfactorily and at this point show the most promise. This configuration will be used on the first pad launches, but design effort and testing will continue. Another test of the missile-to-canister pads will be accomplished during the October 1982 CALTP firing.

(U) The only major subsystem that will not be completely tested as an entity is the nuclear warhead. Safety and treaty agreements require that it be tested in segments, both on the ground and in flight, in ways that will never produce a full yield. The Department of Energy (DOE) will manage this testing in the same manner that they test other nuclear weapons. The DOE will certify yield and reliability. These figures will be used by the military along with other test data to assess weapon system effectiveness.

(U) Weapon system components have yet to be tested in actual flight environments. Confidence that they are flight worthy is being attained through simulating elements of the flight environment on the ground. This is done using vacuum chambers, wind tunnels, vibration tables, ovens, radiation sources, acceleration devices (centrifuge or rocket sled) as appropriate. Since usually only one of these environments can be applied at a time, evaluation of performance in the combined flight environment must be derived analytically.

(U) The technical performance of the missile system elements thus far has been adequate to provide confidence that the desired performance can be met. Though some mean-time-between-failure (MTBF) data was collected during the G&C bench test, the opportunity to obtain maintainability and reliability data is just beginning.

2. Operational Test and Evaluation

(U) This is a combined DT&E/OT&E program. AFTEC manages the OT&E part of the program. OT&E objectives have been fully integrated with DT&E objectives to reduce schedule and cost impacts. An AFTEC test team has been formed which included representative personnel from the using and supporting commands. Personnel have been drawn from SAC, AFLC, AFCC, ATC, and AFTEC for the test team. All test scenarious will be structured to accommodate the objectives of the combined test program. The test approach will be step-by-step integration of each major element of the system in flight and ground tests which commenced with the Pathfinder activities in September 1982. Flight tests will evolve from a test pad to operationally representative facilities at Vandenberg AFB. A series of 20 launches with evolution from mainly DT&E to OT&E oriented objectives is planned.

The operational effectiveness and suitability of the system will be evaluated in an increasingly representative environment. Early engineering model test results will be updated as pre-production and production equipments become available.

3. System Performance

(U) Because the weapon system has many elements that contribute to its effectiveness, and because management tradeoffs between these elements are necessary to identify the most cost effective combinations, M-X program thresholds and goals have been established at the weapon system level.

(U) The two goals and thresholds established for the M-X weapon system by the Program Management Directive (PMD) are the Mission Effectiveness Factor (MEF) and accuracy expressed as Circular Error Probable (CEP).

(U) MEF is defined as the product of Countdown and Flight (C&F) reliability, weapon system available, and targeting efficiency.

(U) Countdown and flight reliability is the probability that a missile system is available for commitment to the launch sequence, responding to a valid launch command, and successfully completes the launch and flight with detonation of a given warhead within accuracy requirements. During the DT&E/OT&E program, the operational C&F reliability will be assessed using flight testing and applicable ground testing such as motor static testing, launch system testing, command, control and communication testing, and guidance and control testing. It is anticipated that failures will occur during the early phase of the flight test program. Causes of the failures will be corrected through a reliability improvement program. Test data will be modified or purged only after sufficient testing has been accomplished to verify the effectiveness of the corrective action. The limited data base available at IOC will not support a high level of confidence in the assessed C&F reliability value. SAC FOT&E results accumulated after IOC will increase confidence in the accuracy of this assessment.

(U) Weapon system availability is the percentage of a missile force capable of commitment to the launch sequence at any random point in time. Prior to IOC, availability predictions will be based upon a probabilistic availabiliy model. Simulations will be used as necessary to verify the availability prediction and to generate inputs to the model for variables, such as spares availability, that are not conducive to probabilistic solution. Subsequent to IOC, actual field experience as reported by the Strategic Air Command will be the basis for availability assessments.

(U) Targeting efficiency is defined as the ratio of the number of targets in a reference target list to the number of reentry vehicles flown to achieve 100% coverage of that same target list. The targeting efficiency assessment will be continually updated from the missile system engineering studies to track the performance of the M-X missile during the DT&E/OT&E program. Missile parameters such as subsystem weights and motor specific impulse may vary during development and test. If so, this will influence missile performance against various target structures.

(U) Accuracy is expressed as CEP which is defined as the radius of a circle centered on the aim point within which 50% of the RVs are expected to be located at airburst or impact. (U) The evaluation of accuracy is a continuing process which begins with the design of the weapon system and continues throughout the life of the flight test program. Initially, error budgets are established at the subsystem level to derive an accuracy budget at the weapon system level. The major subsystems for categorizing accuracy include G&C, targeting, geodetic and geophysics (G&G), and reentry. Under G&C is included inertial measurement unit hardware errors, ground program errors, flight program errors, and certain elements in the deployment sequence. Reentry subsystem errors include the reentry vehicle (RV) and certain elements of separation. Targeting and G&G categorization are primarily accomplished by computer simulations.

(U) During the M-X test program, flight test results will be used to validate the engineering estimates. Confidence in achieving the system accuracy goal will increase during DT&E/OT&E ground and flight testing. A mature system accuracy assessment will be completed approximately 3-5 years after M-X weapon system IOC.

(U) Testing to date, discussed in Section 1, has provided no reason to believe that accuracy or mission effectiveness thresholds cannot be met. We are now entering the time frame were meaningful test results, using the complete missile in ground and flight tests, will become available. These test data will be used to refine estimates of missile system performance and identify areas where design improvements are required.

(U) To date, approximately 85% of the supporting transportation and handling tests and 95% of the facility installation and checkout tests at VAFB have been completed. Stage checkout for the Pathfinder missile is currently in progress.

(U) Testing to date has identified a problem with the Stage II motor ENEC and problems with sticking canister missile pads. To correct the Stage II ENEC Problem, a design fix was implemented on two development motors and tested at simulated altitude at AEDC. The fix survived both tests with no indication of appreciable erosion. The demonstrated ENEC design will be implemented on FTM-1 for first flight.

(U) Tests on the following subystems have been scheduled, started, and/or completed as shown:

	FROM	TO
Propulsion, Full-Scale	Jun 80	Dec 82
FTOS	Aug 80	Dec 82
G&C Integration	Mar 82	Sep 82
AIRS bench	Sep 81	Sep 82
AIRS sled	Jun 81	Sep 81
MECA	Nov 81	Dec 82
RS Stiffness	Mar 82	Mar 82
RS Shock & Vibration	Oct 81	Oct 81
RS Shroud Fly-Away	Dec 81	Dec 81
Modal Survey	Feb 82	Apr 82
EMP/EMI/EMC	Jan 83	Jun 83
CALTP	Jan 82	Oct 82
Flight Software	Jan 81	Dec 82
VAFB Pathfinder	Jun 82	Nov 82
VAFB Pad Launchers	Jan 83	Jun 85

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64326F
DOD Mission Area: #113 Airborne Strike

Title: Strategic Conventional Standoff Capability
Budget Activity: Strategic Programs, #3

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	700*	0	35,000	93,500	155,073	283,573

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides funding for concept validation of conventional standoff weapon compatibility, integration and targeting sensor improvements for present and future strategic bombers. A conventional standoff capability would allow strategic aircraft to autonomously detect, track, identify, engage and destroy mobile, fixed and maritime targets with conventional munitions anywhere in the world while minimizing the aircraft exposure to lethal defenses.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands) not applicable

	FY 1982	Total
RDT&E	700*	700

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

Procurement

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
PE 11113F B-52 Squadron	0	0	0	0	TBD	TBD
PE 11126F B-1B Squadrons	0	0	0	0	TBD	TBD

5. (U) RELATED ACTIVITIES: Strategic Conventional Standoff Capability (SCSC) will validate active and passive targeting sensors and an integrated weapon stores system capable of dealing with existing and planned munitions such as the Harpoon, Medium Range Air-to-Surface Missile (MRASM) PE 27164F, and Joint Tactical Missile System (JTACMS) PE 64324F.

* Funding profile transferred from PE 11113F, B-52 Squadrons, Project 2787 Conventional Standoff Capability.

Program Element: #64326F
DOD Mission Area: #113 Airborne Strike

Title: Strategic Conventional Standoff Capability
Budget Activity: Strategic Programs, #3

6. (U) WORK PERFORMED BY: Strategic Conventional Standoff Capability program will be led by Air Force System Command's Aeronautical Systems Division, Strategic System Program Office at Wright-Patterson AFB, Ohio.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not applicable

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: Strategic Conventional Standoff Capability

A. (U) Project Description: This program implements the recommendations of the B-52G CSC Concept Definition Study conducted under AFSC/ASD contract by the Boeing Military Airplane Company. That study, while focusing on the B-52 specifically, concluded that bomber aircraft with SCSC can stop intervention forces over land, successfully defeat a Soviet Naval Task force, act as a force multiplier for naval support missions, enhance the capability of the Rapid Deployment Force, and provide credible military options between diplomacy and nuclear response.

The study's basic assumptions were built around a SCSC aircraft having an advanced targeting sensor incorporating Synthetic Aperture Radar (SAR) and Inverse Synthetic Aperture Radar (ISAR) techniques. Further, the study used a modern standoff weapon such as the Joint Technical Missile System (JTACMS) with appropriate submunitions as its conventional missile.

While SAR, ISAR, Long Range Passive Location System (LRPLS) and various weapon integration efforts exist separately as concepts and hardware, they have never been integrated together in a unified targeting sensor/weapons package. This program will conduct a concept validation demonstration of such a targeting sensor/weapon integration package. The test demonstration would provide hardware performance data for a viable standoff weapon system and actual sensor and aircraft integration cost data on which to base a production decision for the B-52 and/or B-1B.

B. (U) Program Accomplishments

(1) (U) FY 1982 Accomplishments: The Boeing Military Airplane Company completed the B-52 Conventional Standoff Capability Concept Study that was funded under PE 11113F B-52 Squadrons, Project 2787 Conventional Standoff Capability. That study concluded that the B-52 when equipped with proper standoff weapon and an autonomous targeting capability employing SAR/ISAR techniques, can stop intervention forces over land, successfully defeat a Soviet Naval Task force, act as a force multiplier for naval support missions, and enhance the capability of the Rapid Deployment Force.

(2) (U) FY 1983 PROGRAM: No FY 83 funds are currently programmed for SCSC.

Program Element: #64326F
DOD Mission Area: #113 Airborne Strike

Title: Strategic Conventional Standoff Capability
Budget Activity: Strategic Programs, #3

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Funds are required for FY 1984 to conduct a concept validation demonstration of active and passive targeting sensors and a modern weapon integration station. Request for proposals, contract award, hardware development and integration for the sensor demonstration will be done. Appropriate Acquisition Council Review will be conducted.

(4) (U) Program to Completion: Brass board hardware (radar and modified OAS elements) will be developed for subsystem evaluation. Hardware will be integrated into a B-52 aircraft test bed leading to a test flight program. Project will be complete with evaluation of flight test data, deficiency corrections if any, and aircraft demodification. The program would lead into a production prototype program in FY 1986 for the B-52 and a TBD modification for the B-1B.

C. (U) Major Milestones:

(1) (U) RFP Release	2Q FY 1984
(2) (U) Contract Award	3Q FY 1984
(3) (U) Aircraft Modification	2Q FY 1986
(4) (U) Test Flight	4Q FY 1986

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64361F
DOD Mission Area: #113, Airborne Strike

Title: Air Launched Cruise Missile, AGM-86B
Budget Activity: #3, Strategic Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	68,720	19,200	28,547	28,472	82,133	1,309,292

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Air Launched Cruise Missile (ALCM) greatly enhances the air breathing leg of the Triad by: stressing and diluting Soviet defenses, thus improving the overall penetration prospects of the mixed air breathing force; compelling the Soviets to devote substantial resources to their national air defenses to counter this threat; increasing the number of weapons in our strategic forces in the near term and convincing the Soviets that their massive air defense efforts will not substantially blunt United States air breathing strike capabilities.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in Thousands)

PE 64361F/RDT&E	68,741	26,338	19,730	N/A	74,000	1,206,300
PE 11122F/Missile Procurement	597,104	646,000	634,700	N/A	3,491,100	6,508,900

(U) The additional FY84 (+8.8M), FY85 (+28.5M) and to complete (+8.1M) RDT&E requirement is to correct Mission Planning deficiencies, initiate a Combined Environmental Reliability Test (CERT) program, develop depot level support equipment and accomplish missile software maintenance.

A 2 December 1982 OSD Decision curtailed the AGM-86B procurement program with the FY83 buy. Furthermore, FY83 Congressional actions scaled down the FY83 RDT&E and procurement program in favor of an Advanced Cruise Missile (ACM) program. Total ALCM-B procurement will be 1499 to support [ ] The total ALCM PAA (ALCM-B and ACM) will be [ ] (Approximately 3200 total buy). Procurement funding for FY 84 and beyond is for ALCM-B support equipment only.

4. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Missile Procurement	597,145	524,500	103,937	89,057	183,396	2,638,047
(Missile Quantity)	(440)	(330)	(0)	(0)	(0)	(1499)

Program Element: #64361F
DOD Mission Area: #113, Airborne Strike

Title: Air Launched Cruise Missile AGM-86B
Budget Activity: #3, Strategic Programs

Military Construction	102,280	0	20,000	37,700	201,915	443,200
Department of Energy Costs (W-80 Warhead)						[ ]

* W-80 cost based on [ ] W-80 cost will be adjusted downward to reflect new requirements in stockpile memorandum changes.

5. (U) RELATED ACTIVITIES: The AGM-86B ALCM, the land attack Sea Launched Cruise Missile (SLCM), and the Ground Launched Cruise Missile (GLCM) programs are structured to have maximum commonality in engine and navigation/guidance subsystems. The ALCM and SLCM share the common W-80 nuclear warhead under development by the Department of Energy. The SLCM and GLCM, the engine, navigation/guidance and mission planning projects are jointly managed through the JCMPO. However, after the April 1980 production decision, management of the ALCM was transferred to the Air Force Strategic Systems Program Office (SSPO). The B-52 Squadrons, Program Element (PE) 11113F, is also related to the ALCM. The B-52 Cruise Missile Carriage, Offensive Avionics System, and other projects require close coordination with the ALCM program to ensure full compatibility. A memorandum of understanding exists between Air Force Systems Command and the JCMPO which delineates interface tasks. Development for an improved F107 ALCM engine (14A6 redesignated F112) is being conducted under the Advanced Cruise Missile Technology PE 63319F. Development of an Advanced Cruise Missile (ACM) will be conducted under a special access required PE.

6. (U) WORK PERFORMED BY: The SSPO works under the Aeronautical Systems Division, Wright-Patterson Air Force Base, OH in cooperation with the JCMPO (Naval Material Command), Washington, DC. The ALCM program also interfaces with; Department of Energy, Washington, DC (W-80 warhead); Defense Mapping Agency, Washington, DC and St. Louis, MO, Strategic Air Command and Joint Strategic Target Planning Staff, Offutt AFB, NE (terrain contour matching map and mission planning). Department of Defense in-house facilities include: Arnold Engineering Development Center, TN; Naval Ship Research and Development Center, Bethesda, MD; Naval Air Propulsion Center, Trenton, NJ; Radar Target Scatter Facility and White Sands Missile Range, Holloman AFB, NM; Air Force Weapons Laboratory and Air Force Test and Evaluation Center, Kirtland AFB, NM; 4550th Test Wing and the Flight Dynamics Laboratory, Wright-Patterson AFB, OH; 6514th Test Squadron, Hill AFB, UT; Air Force Flight Test Center, Edwards AFB, CA and the Pacific Missile Test Center, Point Mugu, CA. The major contractors are: air vehicle - Boeing Aerospace, Seattle, WA; carrier aircraft equipment/cruise missile integration Boeing Military Aircraft Company, Wichita, KS; engine - Williams International Corporation, Walled Lake, MI and Teledyne CAE, Toledo, OH; navigation guidance - McDonnell Douglas Astronautics St. Louis, MO, Litton Industries, Woodland Hills, CA, Litton Canada Limited, Toronto, ONT, Minneapolis Honeywell, Minneapolis, MN; recovery system - Pioneer Parachute Company, Manchester, CT and Irvine Company, Los Angeles, CA.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 84: N/A

8. (U) AIR LAUNCHED CRUISE MISSILE (SINGLE PROJECT OVER $10 MILLION IN FY 84):

A. (U) Project Description: The Air Launched Cruise Missile is a small, long range, accurate, nuclear armed air-to-ground cruise missile. ALCM carriage and launch will be from bomber aircraft. Initially, ALCM carriers will be B-52G/H aircraft, both on external pylons and internal launchers (B-52G external only, B-52H both external/internal).

Program Element: #64361F
DOD Mission Area: #113, Airborne Strike

Title: Air Launched Cruise Missile, AGM-86B
Budget Activity: #3, Strategic Programs

The B-1B aircraft will also be cruise missile capable for use in the 1990s and beyond. The missile is powered by a small turbofan engine in the 600 pound thrust category. Missile navigation is accomplished by means of an inertial navigation system and a terrain contour matching (TERCOM) system.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Prime FY 1982 activity was meeting the December 1982 Initial Operational Capability at Griffiss Air Force Base, NY (The First Squadron of B-52Gs modified with Offensive Avionics System (OAS) equipped with 12 external ALCMs). The ALCM Follow-on Operational Test and Evaluation program completed the last launches from the modified OAS B-52G aircraft. Second sources were qualified for the F-107 engine. Development of depot level support equipment continued. Engineering changes resulting from the Follow-on Operational Test and Evaluation program were documented and incorporated into the production design. Retrofit kits were developed to update missiles in the operational inventory to the approved configuration. The ALCM site activation task force was active at Wurtsmith Air Force Base, MI, the second ALCM base. Site activation initiated interim contractor support to assist in maintaining initial operational readiness of the ALCM.

(2) (U) FY 1983 Program: The major portion of the FY 83 effort will be to continue development of depot level support equipment and continue to refine the ALCM Mission Planning System (MPS).

(3) (U) FY 1984 Planned Program and Basis for RDT&E Request: FY84 efforts will be to continue depot level support equipment and MPS. Initiate a Combined Environment Reliability Test (CERT) program. Initiate an ALCM-B engine retrofit program that will increase thrust by 22% and extend recertification cycle from 30 to 60 months.

(4) (U) Program to Completion: The development activity planned beyond FY 1984 will be the start of the ALCM/ B-1B integration effort.

C. (U) Major Milestones:

Milestones	Dates
1. Defense System Acquisition Review Council I (Program Initiated)(AGM-86A)	February 1974
2. Defense System Acquisition Review Council II (AGM-86A)	December 1974
3. Defense System Acquisition IA (AGM-86A)	March 1975
4. Jettison Tests Completed (AGM-86A)	June 1975
5. Engine Preliminary Flight Rating Test Complete	October 1975
6. Initial Department of Energy Phase III (Warhead)	February 1976
7. First Powered Flight (AGM-86A)	March 1976
8. First Guided Flight (AGM-86A)	September 1976
9. Defense System Acquisition Review Council II (AGM-86A/B)	January 1977

Program Element: #64361F
DOD Mission Area: #113, Airborne Strike

Title: Air Launched Cruise Missile, AGM-86B
Budget Activity: #3, Strategic Programs

10.	AGM-86B/AGM-109 Competition Directed	July 1977
11.	System Design Reviews	May 1978
12.	First Full Scale Engineering Flight	July 1979
13.	Source Selection	March 80
14.	Defense System Acquisition Review Council III (Production Decision)	April 1980
15.	Follow-on Operational Test and Evaluation	June 1980 - October 1982
16.	First Alert Capability (One B-52G)	September 1981
17.	Initial Operational Capability (First B-52G Squadron)	December 1982
18.	Full Operational Capability (AGM-86B)	Fiscal Year 1985

Budget Activity: Strategic Program #3
Program Element: Air Launched Cruise Missile

Test and Evaluation Data

1. (U) Development Test and Evaluation: In 1975 and 1976, six advanced development tests were conducted on the medium range Boeing AGM-86A Air Launched Cruise Missile (ALCM). Jettison tests were successful, demonstrating that the AGM-86A could be safely launched at low and high airspeeds, and four of the six flight tests were successful. The fifth flight went out of control because the stable platform of the inertial navigational element tumbled and the sixth flight failed to obtain an engine start.

(U) The General Dynamics AGM-109 ALCM inherited the Development Test and Evaluation (DT&E) base of the BGM-109 Sea Launched Cruise Missile (SLCM). The SLCM has had a total of 90 flight tests as of 22 July 1982. The Joint Cruise Missiles Project Office's records indicate that 66 were successful while 24 were failures. Previously identified problems have been resolved and reported by the SLCM program.

(U) The Full Scale Engineering Development (FSED) program for the long range ALCM is structured into two phases. The first phase was the competitive flyoff between the AGM-86B and the AGM-109 with the AGM-86B chosen to proceed into production. The second phase consists of 20 follow-on flights to support B-52G/ALCM integation. The FSED test program began in April 1979 with B-52 flutter and jettison tests of each missile configuration. Two modified B-52Gs (one for each contractor) were delivered to Edwards Air Force Base, CA in May 1979 to begin the missile competitive flight test program. A third B-52 was used at Edwards Air Force Base for performance, flutter and jettison tests. The competitive flight test program ran from July 1979 through 8 February 1980 and consisted of B-52 performance evaluations with ALCM loaded; captive carry tests as required; live launches (ten flights per contractor); reliability and maintainability demonstrations; mid-air recovery; and survivability and vulnerability testing. During the flyoff, 10 AGM-86Bs and 7 AGM-109s (3 were refurbished and reflown) were tested. The ten flights per competitor were further divided into three DT&E flights conducted by the contractors and seven Development Test and Evaluation/Initial Operational Test and Evaluation flights conducted by a joint Air Force Development Test and Evaluation/Initial Operational Test and Evaluation (DT&E/IOT&E) test team. The IOT&E was managed by the Air Force Test and Evaluation Center. Of the twenty flights, twelve were successful, two unsuccessful and six partially successful. There were no significant problems with either of the missiles or the B-52 flutter and jettison tests.

(U) The Boeing AGM-86B missile was selected on 25 March 1980. The AGM-86B is now particpating in an additional 20 flight Follow-on Operational Test and Evaluation program that began in June 1980 and was completed in October 1982. The follow-on testing used 11 missiles from the fiscal year 1978/1979 buy and nine refurbished missiles. Of the 20 flights 14 were successes (10 consecutive), three partial successes and three were failures. One of the partial successes was due to telemetry loss and not missile related. The second was due to a bad Terrain Contour Matching update fix (off course) in which the missile crashed in very rough terrain during terrain following flight.

Budget Activity: <u>Strategic Program #3</u>
Program Element: <u>Air Launched Cruise Missile</u>

The third partial success was caused by an earlier termination due to bad weather in the test range area. The first failure was caused by excessive carbon build-up in the engine resulting in first stage turbine burn-through. The second unsuccessful mission occurred when the launch sequence failed to deploy missile aero surfaces caused by an ejector rack solenoid failure. The third failure was due to an uncommanded engine shutdown caused by a faulty fuel control unit. All necessary hardware modifications to correct these problems have been identified and implemented. Eleven of the 20 missions completed the Air Launched Cruise Missile/Cruise Missile Integrated (ALCM/CMI) B-52G aircraft interface and nine missions used the B-52G Offensive Avionics System (OAS) aircraft with Block 0 and Block 1 software updates. The next ALCM test called Integrated Weapon System (IWS) Phase I FOT&E, will be managed/conducted by the Air Force Test and Evaluation Center using Strategic Air Comamnd operational assests (crews, bombers and missiles). The first of 15 IWS Phase I missions is scheduled for December 1982.

(U) The missiles tested during the flyoff were representative of those that will be procured. Changes identified during the flyoff were tested by Boeing during the 20 flight follow-on phase. Included will be a new radar altimeter and the production configured engine. Support equipment, missile handling equipment and full capability electronic systems test sets will be tested during the follow-on test period.

(U) Testing of the missile was conducted out of Air Force Flight Test Center using primarily the Utah Test and Training Range and Pacific Missile Test Center. A combined test team consisting of Air Force Test and Evaluation Center personnel conducted the the test under the management of the Joint Cruise Missiles Project Office.

(U) The Air Launched Cruise Missile (ALCM) competition involved Boeing Aerospace, Seattle, WA, and General Dynamics Convair, San Diego, CA for the missile. Williams International, Walled Lake, MI is the prime contractor for the engine. Teledyne CAE, Toledo, OH, will be the second source for the engine. Teledyne will start qualification testing of its copy of the engine in late 1981. McDonnell Douglas, St Louis, MO provided navigation/guidance hardware to both missile contractors, but participated in the competition with Boeing by providing navigational software to General Dynamics. Boeing Military Aircraft Company, Wichita, KS is the cruise missile integration contractor responsible for B-52G modification and integration. ALCM development and initial production were managed by the Joint Cruise Missiles Project Office (JCMPO) with the Navy as lead service. Rear Admiral Walter M. Locke was Program Director. The ALCM responsible test organization is the Air Force Flight Test Center Edwards Air Force Base, CA. The Air Force Test and Evaluation Center is the independent operational test agency for ALCM. The Aeronautical Systems Division at WrightPatterson Air Force Base, OH assumed ALCM program management responsibility in April 1980 with Major General Melvin F. Chubb as Program Director. Management transfer occurred after the 17 April 1980 production decision which approved full rate ALCM production. Engine and navigation/guidance systems management still remains with the JCMPO.

Budget Activity: <u>Strategic Program #3</u>
Program Element: <u>Air Launched Cruise Missile</u>

(U) Wind tunnel testing was accomplished at Arnold Engineering Development Center (AEDC) and the Naval Ship Research Development Center. Engine flight qualification and calibration occurred in fiscal years 1979/1980 at the AEDC and the Naval Air Propulsion Center. Rotary launchers were proof qualification tested in fiscal year 1979. Pylon proof testing began in February 1979. Pylon Jettison began in August 1980.

(U) Environmental testing in fiscal year 1979 consisted of static icing tests of the competing missiles. Fiscal year 1980 activities included simulated free flight icing tests of the missile in the AEDC wind tunnel and icing flight tests of the missile/pylon/ B-52G combination using the KC-135 water spray tanker. The fiscal year 1981 effort consisted primarily of test planning and facility set up for further missile icing tests at AEDC and free flight icing test. The inflight icing test was successfully completed in January 1982.

(U) Development Test Reports published: <u>AGM-86 Air Launched Cruise Missile (ALCM) DT&E Competitive Test Program</u>, Vol I thru VI, May 1980 and <u>AGM-109 Air Launched Cruise Missile (ALCM) DT&E Competitive Test Program</u>, Vol I thru VI, May 1980.

(U) The majority of the reliability and maintainability testing is being conducted during the follow-on test program now that sufficient production configured support equipment is available. During the flyoff the contractors were expected to demonstrate a test reliability of .575 to .744 for a hypothetical mission of 12 hours captive carry and 5 hours of free flight. A value of .68 was achieved. Ground test demonstrations conducted during the flyoff were evaluated as part of the competition. These included pylon/ launcher loading, vehicle exchanges, payload exchange and limited capability electronic systems test set testing. These tests were conducted by Air Force Flight Test Center and Air Force Test And Evaluation Center personnel at Edwards Air Force Base, CA.

2. (U) <u>Operational Test and Evaluation</u>: The Air Force Test and Evaluation Center (AFTEC) was responsible for Initial Operational Test and Evaluation (IOT&E) and the early phase of Follow-on Operational Test and Evaluation (FOT&E) of the Air Launched Cruise Missile (ALCM). The ALCM test team was located at Edwards AFB, California, and comprised of personnel from AFTEC, Strategic Air Command (SAC), Air Force Logistics Command, and Air Training Command. The test program combined ALCM and B-52 Offensive Avionics System (OAS) testing. In addition, an AFTEC test team was established at Griffiss AFB New York in January 1982 to conduct the operational suitability evaluation for the combined systems.

(U) A combined Development Test and Evaluation (DT&E)/FOT&E was conducted following the combined DT&E/IOT&E competitive fly-off between Boeing Aerospace Company (BAC) and General Dynamics-Convair. Selection of the BAC AGM-86B was announced on 25 March 1980 after the DT&E/IOT&E fly-off. The Defense Systems Acquisition Review Council (DSARC) III, which met on 17 April 1980, provided direction for production of 225 missiles in FY 80, FOT&E, continuation of reliability and maintainability efforts, and management attention on improving BAC quality assurance discipline for this program. ALCM FOT&E testing from April 1980 through May 1981 consisted of 11 ALCM launches from the same B-52G BAC used during the competition. Operational effectiveness test results to date are inconclusive with the exception of mission reliability for which the data clearly indicated that substantial improvements are required. Operational effectiveness areas that are satisfactory include range, selection of alternate mission profiles, arming and fusing,

Budget Activity: Strategic Program #3
Program Element: Air Launched Cruise Missile

missile status monitoring, and B-52G flight handling characteristics. Operational performance of the AGM-86B in areas such as accuracy, terrain following, and the low altitude portion of the launch envelope are as yet undetermined. The suitability factors of availability, logistics supportability (excluding technical data), training and human factors were all previously rated as satisfactory. Recent test results, however, have led to reduced availability predictions. Mission planning system capability and overall suitability of software are undetermined and major efforts will be required to complete these evaluations before Initial Operational Capability (IOC).

(U) After the Air Launched Cruise Missile (ALCM) initial Follow-On Operational Test and Evaluation (FOT&E) was completed all ALCM launches used on Offensive Avionics System (OAS) modified B-52G for the lauch platform. Two launches were completed in August and September 1981 as part of the OAS initial operational Test and Evaluation (IOT&E) conducted at the Boeing Facility at Wichita, KS. Four ALCM launches were conducted at Edwards Air Force Base (AFB) CA from October 1981 through January 1982. Three ALCM lauches are planned during Development Test and Evaluation (DT&E)/ Operational Test and Evaluation (OT&E) of Offensive Avionics System (OAS) Block 1 and ALCM Revision B software block updates in August and September 1982. Monthly ALCM launches are planned during this 15 month program plus numerous OAS missions. Negotiations are proceeding to transfer test management responsbility to Strategic Air Command on or about April 1983.

(U) The significant milestone remaining in the ALCM program is the IOC in December 1982.

(U) OT&E flight tests will continue to be conducted over and between several western test ranges, i.e., Utah Test and Training Range, Tonopah, Pacific Missile Test Range, and the Edwards Range. In addition, captive-carry flights will continue over the western part of the United States.

(U) The additional testing, directed by the Defense Systems Acquisition Review Council III, was designed to provide specific performance parameters to the user and to test required changes before putting the missile on sustained alert. The objectives cover the following areas: operational performance parameters, mission reliability, compatibility and interoperability, survivability, mission planning, availability, logistics reliability, maintainability, logistics supportability, operations and support cost training, human factors, and software suitability.

(U) Testing of the Air Launched Cruise Missile (ALCM) has been affected by a number of factors both internal and external to the program. Fiscal and time constraints limited the number of actual missile launches to 10 per contractor during the competition and delayed availability of some pieces of support equipment at the test site until after the production decision. Four of the 10 Boeing Aerospace Company competition AGM-86Bs crashed. Crashes occurred on four of 11 launches in the initial Follow-on Operational Test and Evaluation (FOT&E), and one other launch resulted in a no-test due to lost telemetry. The last launch in the initial FOT&E series was in April 1981 with seven additional successful launches from August 1981 to August 1982 as part of the Offensive Avionics System (OAS) program. Updating of the B-52G with the OAS caused some change in Initial Operational Test and Evaluation (IOT&E) programs for both systems. Several ALCM test objectives were delayed until after September 1981 First Alert Capability (FAC) and an OAS-equipped B-52G was available. Examples of these objectives are: total system mission reliability, interoperability, compatibility, and some maintainability and logistics supportability items.

Budget Activity: Strategic Program #3
Program Element: Air Launched Cruise Missile

(U) OT&E Reports Published:

ALCM Operational Test and Evaluation Final Report, AFTEC, September 1981.

ALCM Survavability Follow-on Operational Test and Evaluation Final Report, May 1982.

3. System Characteristics: Performance data are Decision Coordinating Paper thresholds/goals.

Physical Characteristic	Boeing AGM-86B
Length (feet)	20.75
Diameter (inches)	27.3
Weight (pounds)	3144
Wing Span (feet)	12.0
Wing Area (square feet)	11.0
Warhead Yield (kilotons)	[ ]
B-52 Internal Carriage (each)	8
B-52 External Carriage (each)	12

Performance Data	Threshold	Goal	Demonstrated
Maximum Low Altitude Speed (Mach number)	[		]
Minimum Launch Altitude (feet)			
Minimum Enroute Altitude (feet)			
Propulsion Range (kilometers) 1/			
System Operational Range (kilometers)	2500	2500	2500
Accuracy (Circular Error Probable (feet)2/	[		]

1/ Low altitude at [ ]

2/ At [ ] last fix within [ ] of target, terminal cell size [ ]

3/(U) Extrapolated flight test data.

4/(U) Median accuracy value.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64406F
DoD Mission Area: Space Defense, #123

Title: Space Defense Systems (Antisatellite)
Budget Activity: Strategic Programs, #3

1. (U) RESOURCES (PROJECT LISTING)($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	200,900	209,482	205,624	108,291	Continuing	Not applicable
2134	Miniature Systems	162,600	190,982	194,624	98,491	Continuing	Not applicable
2135	Advanced Systems	20,500	700	500	600	Continuing	Not applicable
2241	Instrumented Target Vehicle	17,800	17,800	10,500	9,200	Continuing	Not applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program is developing and testing an antisatellite (ASAT) system in response to guidance contained in National Space Policy and the Secretary of Defense approved Mission Element Need Statement. This system is designed to deter Soviet ASAT attacks on U.S. space systems and to remove the sanctuary status the Soviets currently enjoy in space by providing a capability to deny them the use of those space assets which enhance the effectiveness of their land, sea and aerospace forces. The air-launched ASAT currently under development consists of a modified Short Range Attack Missile (SRAM) first stage, an ALTAIR III second stage and a Miniature Vehicle (MV) warhead. ASAT missiles will be launched from designated, dual mission, air defense F-15s. To support ASAT testing, a dedicated target satellite (Instrumented Target Vehicle) is also being developed. (Project 2241). To permit the Air Force to be responsive to the evolving threat, Project 2135 funds investigations into advanced technologies for possible future ASAT applications.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	200,900 1/	211,764 2/	179,038 3/	-	Continuing	Not Applicable
Procurement (Missiles - 3020)	0	0	32,800 3/	-	Continuing	Not Applicable

1/ $900,000 reprogrammed to fund advanced space-based concepts.
2/ Funding reallocated to other high priority Air Force needs.
3/ $31,462,000 added in FY 1984 to fund the risk reduction efforts described in Para 8B. $13,000,000 of this $31,462,000 was transfered from Program Element (PE 12450F), Missile Procurement because of a restructuring of FY 1985 ASAT procurement activities. FY 1984 long-lead Missile Procurement can be adequately funded with the remaining $19,409,000 (See Para 4). Also reflects inflation adjustments.

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Program Element: #64406F
DoD Mission Area: Space Defense, #123

Title: Space Defense Systems (Antisatellite)
Budget Activity: Strategic Programs, #3

4. (U) OTHER APPROPRIATION FUNDS ($ in thousands):

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Complete	Total Estimated Cost
- ASAT Missile Procurement (PE 12450F)						
Funds (3020)	0	0	19,409	196,942	Continuing	Not Applicable
Quantities	0	0	Long Lead	10	Continuing	Not Applicalbe
- Weapon Pylons and Pallets (PE 12450)						
Funds (3010)	0	0	0	35,100	Continuing	Not Applicable
Quantities	0	0	0	2	Continuing	Not Applicable
- Military Construction (PE 12450) (3300)	0	0	0	10,713	11,279	21,992

5. (U) RELATED ACTIVITIES: This program is part of the Air Force Space Defense Systems Program effort involving four functional areas: Antisatellite, Space Surveillance Technology, Satellite Systems Survivability, and Command and Control. Program Element 63438F, Satellite Systems Survivability, is developing generic technology to enhance the survivability of United States space systems. Program Element 63428F, Space Surveillance Technology, is developing improved surveillance capabilities to support ASAT targeting. Program Element 12311F, North American Air Defense Command Combat Operations Center, and Program Element 12424F, SPACETRACK, provide the needed command and control and tracking capability so the ASAT system can be targeted.

6. (U) WORK PERFORMED BY: Air Force Systems Command's Space Division in Los Angeles, CA, manages this program. Aerospace Corporation, El Segundo, CA, provides technical support. Air-launched ASAT major contractors are: Vought Corporation, Grand Prairie, TX, and the Boeing Aerospace Corporation, Seattle, WA. AVCO, Wilmington, MA, is developing the Instrumented Target Vehicle. The Arnold Engineering Development Center and Air Force Systems Command Space and Missile Test Organization are both supporting the ASAT development and test efforts.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

Project #2135: Advanced Systems. This projects funds the study, analysis and preliminary development of advanced second/third generation antisatellite (ASAT) concepts. Backup, high-explosive ASAT techniques have also been examined. Advanced physical interceptors and directed energy techniques are currently being evaluated. The Air Force continues to participate in the DoD ground-based, airborne, and space-based lasers studies so when this technology matures, lasers weapon systems can be considered for ASAT and other mission applications. [ ]

Other, far-term directed energy techniques (e.g., particle beams) are also being examined. A low-power, non-lethal demonstration of a ground-based laser ASAT is scheduled for [ ] under PE 63605F. Test results from this demonstration will be evaluated to provide a basis in late [ ] for a decision on the operational utility of an operational ground-based laser ASAT. A mission analysis will be completed in FY 1983 on the potential ASAT applications of airborne laser systems in widebodied cargo aircraft. An examination of near-term ASAT applications of promising far-term ballistic missile defense (BMD) technology will be completed in [ ]

Program Element: #64406F Title: Space Defense Systems (Antisatellite)
DoD Mission Area: Space Defense, #123 Budget Activity: Strategic Programs, #3

8. (U) PROJECT OVER $10M IN FY 1984:

(U) Project: Miniature Systems, #2134

A. Project Description: The ability of the Soviet Union to use military power on a worldwide basis is increasingly dependent on effective and reliable operation of various satellite systems. These systems enhance the performance of Soviet surface, sea and aerospace forces and The U.S. ASAT program is designed to deny the Soviets use of those systems. The Air Force antisatellite (ASAT) program is also a response to the demonstrated Soviet ASAT capability. In the absence of a comparable United States system or comprehensive and verifiable negotiated limits on ASAT systems, the Soviet ASAT program raises the prospect of a unilateral Soviet military advantage which could also have adverse political implications. Such an advantage, could be detrimental to U.S. interests. It currently provides options to the Soviets during crisis and conflict that the United States cannot match.

The projects funds the development and test of the Air-Launched Miniature Vehicle (ALMV) ASAT consisting of a modified Short-Range Attack Missile first stage, a modified ALTAIR III second stage and a Miniature Vehicle terminal warhead stage. Kill mechanism is Development and deployment of a U.S. ASAT capability is endorsed by the Administration's National Space Policy. Flight testing is scheduled to begin in

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: At the recommendation of several high-level advisory groups, including a subcommittee of the Air Force's Scientific Advisory Board and Space Division's Advisory Group, the ASAT program was modified in the Spring of 1982 to reduce technical risk and improve confidence in system performance. More extensive ground tests, flight tests, a full system qualification test and several small technical improvements were added to the baseline program. A Critical Design Review of the air-launched missile, the carrier aircraft equipment (weapon pylon and pallet), and the necessary support equipment was completed. The first of two modified F-15s was delivered to support the test program. Integration of the Miniature Vehicle (MV) software was completed. System integration and test efforts of the total ASAT missile continued toward certification of the system's readiness for flight test. Fabrication of missile flight-test hardware neared completion.

(2) FY 1983 Program: Qualification testing will be completed on the MV and the missile. System integration and tests efforts will certify the system's readiness for flight test. The second ASAT modified F-15 will be delivered. Fabrication of flight-test hardware will continue. Captive flight test will begin in The first live launch (a Point-in-Space test to evaluate booster propulsion and guidance performance) is scheduled to take place in The pre-production phase of the program will start and is designed to identify the necessary steps to transition the ASAT R&D configuration to a production configuration. Risk reduction efforts initiated in FY 1982 will continue. Additional diagnostic instrumentation will be added to the test missiles and additional ground tests at the Air Force's Arnold Engineering Development Center (AEDC) will be conducted.

Program Element: # 64406F
DoD Mission Area: Space Defense, # 123

Title: Space Defense Systems (Antisatellite)
Budget Activity: Strategic Programs, #3

(3) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: ASAT flight testing will continue. An infrared phenomonology flight test is scheduled for [ ] and is designed to evaluate MV sensor performance in a representative space environment while gathering data [ ] Additional flight tests will continue throughout the year. System improvement studies will be initiated as test results dictate. Operations, maintenance, deployment and base activation planning for the operational ASAT will continue. Program cost estimates are from existing Cost Plus Incentive Fee contracts for the flight test program.

(4) Program to Completion: This is a continuing program. Flight testing will continue against [ ] A Limited Capability (LC) may be declared during the test program, if system performance so warrants, using residual test assets. ASAT facilities at Langley AFB, VA, will be activated to support the [ ] Initial Operational Capability (IOC). McChord AFB, WA, will become the second ASAT base in [ ] ASAT production will continue to counter the applicable threat. As the threat matures, new development efforts should be anticipated.

C. (U) Major Milestones:

(1)	Start Fabrication of Flight-Test Missiles		[ ]
(2) (U)	Miniature Vehicle Ground Tests Complete	*(Jun 1982)	January 1983
(3)	First Modified F-15 Available for Test		[ ]
(4)	First Missile Captive Flight Test		[ ]
(5)	First Instrumented Target Vehicle (ITV) On-Orbit	[ ]	[ ]
(6)	Missile Qualification Test Complete	[ ]	[ ]
(7)	MV Qualification Test Complete	[ ]	[ ]
(8)	First Flight Test	[ ]	[ ]
(9)	Initial Operational Capability	[ ]	[ ]

* Data presented in Fiscal Year 1983 Descriptive Summary

(U) EXPLANATION OF MILESTONE CHANGES

(2) One system-level [ ] test remains. All other tests completed on schedule. [ ]

(5) (U) Launch of first ITV slipped as part of Risk Reduction efforts. No development problems.

(6) (U) "Missile Flight Worthiness Test" changed to "Missile Qualification Test" as part of Risk Reduction efforts. Qualification Testing imposes more severe environments than Flight Worthiness testing.

(7) Reflects later requirement for first flight test with a [ ]

(8) Reflects risk-reduction decision (endorsed by the Under Secretary of Defense Research and Engineering) to conduct additional pre-flight ground tests and [ ] prior to the first flight test (See FY 82 Accomplishments).

Program Element: # 64406F
DoD Mission Area: Space Defense, # 123

Title: Space Defense Systems (Antisatellite)
Budget Activity: Strategic Programs, # 3

9. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: Instrumented Target Vehicle, # 2241

A. Project Description: Instrumented Target Vehicles (ITV) are required as orbital test targets to evaluate the effectiveness of the antisatellite (ASAT) system being developed under Project 2134, Miniature Systems. The target is required to resolve miss distances from the target centroid to evaluate the circular error probable (CEP). Miniature Vehicle specifications call for a CEP of [ ]. The ITV is a [ ] diameter balloon with a controllable [ ] system (for simulating different Soviet targets) and [ ] instrumentation. Two ITVs can be launched from a single SCOUT booster and are controlled on orbit by the Air Force Satellite Control Facility.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) FY 1982 Accomplishments: Fabrication of the ITVs for the air-launched ASAT flight test program continued. System-level qualification testing and final performance tests (dynamic structure, canister function, antenna patten and [ ] verification) were rephased and extended in accordance with the modified requirements of the flight test program. Initial integration testing between the ITV and its SCOUT booster was conducted.

(2) FY 1983 Program: Fabrication of the ITVs for the ASAT flight test program will continue and system-level qualification and final performance tests will be completed. A communication link between the launch site and the Air Force Satellite Control Facility will be established. The first four ITV satellites will be delivered. The first [ ]

(3) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The last six will be delivered. [ ] ITVs will be launched in support of the ASAT flight tests. Post-flight analyses will continue. Cost estimates are based on current fixed price contracts and launch cost estimates provided by NASA and Air Force Systems Command's test ranges.

(4) Program to Completion: The last [ ] ITVs will be launched in support of the ASAT flight tests. Assuming a successful development test and engineering effort for the ASAT, the current ITV program will complete in the [ ] time period. Target vehicles for operational proficiency training, evaluation of advanced ASAT techniques (e.g., lasers), and countermeasures testings will require additional RDT&E funding in the out years.

C. MILESTONES

(1)	(U)	Instrumented Target Vehicle Contract Award	May 1979
(2)	(U)	Design Review to Authorize Fabrication	September 1980
(3)		Performance Tests Complete	[ ]
(4)		Qualification Tests Complete	[ ]

Program Element: #64406F
DoD Mission Area: Space Defense, #123

Title: Space Defense Systems (Antisatellite)
Budget Activity: Strategic Programs, #3

(5) Launch First Vehicle (2 ITVs) [ ]
(6) (U) Contract End *(Feb 1985) September 1985

* Data presented in FY 1983 Descriptive Summary

(U) EXPLANATION OF MILESTONE CHANGES

(3) (U) Slip caused by late delivery of electronic piece parts
(4) (U) Same as item 3 above
(5) (U) Slip due to rephasing ofthe ASAT program (See FY 1982 Accomplishments, Project 2134)
(6) (U) Same as item 5 above

Budget Activity: Strategic Programs, #3
Program Element: # 64406F, Space Defense Systems (Antisatellite)

Test and Evaluation Data

1. (U) Development Test and Evaluation: During FY 82, antisatellite (ASAT) system testing has transitioned from component-level testing to major system element assembly, checkout and functional testing. Mechanical fit checks of flight hardware with the F-15 were completed and integrated system tests are in progress. Detailed flight test planning is being emphasized with substantial participation by the contractors, Air Force Western Test Range, the Air Force Test and Evaluation Command, and the Air Force Flight Test Center.

(U) The second or upper stage (U/S) of the ASAT missile uses the Vought Corporation ALTAIR motor. The ALTAIR is a proven Scout booster fourth stage which has been modified for ASAT flight environments. A limited qualification program is in progress. Two development motor firings have been successfully accomplished. The first was conducted at ambient pressures with a temperature gradient between the external skin and the core, and the second at simulated altitude at constant 40°F temperature. One more development and two flight-worthiness tests are to be completed prior to April 83. The U/S Reaction Control System (RCS) which provides missile altitude control was tested in August and September of 82. The RCS tests were successful, assuring that available control capability will meet or exceed mission requirements. The missile shroud is a fiberglass envelope which protects the Miniature Vehicle (MV) during atmospheric flight and is separated from the U/S at MV activation. Three tests showing that the shroud separates cleanly from the U/S at the required velocity have been completed successfully. The U/S is separated from the ASAT lower stage (L/S) subsequent to L/S burnout. Three U/S-L/S separation tests have been planned, and two have been accomplished to date. The tests performed show that separation is accomplished within performance requirements. The Missile Guidance Assembly (MGA) is contained in the U/S. Software for the MGA computer has been developed by Boeing, Vought, and Singer. Software verification tests are in progress and formal validation tests will follow. Logicon is providing independent verification and validation testing of software for all ASAT flight computer systems and for flight-critical ground software.

(U) The pallet, pylon launcher, cryogen system, Environmental Control System (ECS) and the Interface and Converter Unit (I&CU), when integrated, constitute the F-15 Carrier Aircraft Equipment (CAE). The flight CAE completed mechanical fit checks with the F-15 in September 82. I&CU software is in verification and validation testing. The cryogen system which provides cooling for the MV sensor assembly was successfully tested in December 81. The ECS provides air conditioning to the missile and was tested in November 80. Static structural load testing of the pylon was accomplished in February 82. No yielding at limit or failure at ultimate loads were experienced by the pylon. Dynamic tests of the pylon launcher assembly were started in September 82. Eight tests with a missile simulator are planned under conditions which include air loads simulation and umbilical icing. Umbilical separation forces and missile ejection velocities will be evaluated.

Budget Activity: Strategic Programs #3
Program Element: #64406F, Space Defense Systems (Antisatellite)

(U) The antisatellite (ASAT) first stage or Lower Stage (L/S) is a standard Short Range Attack Missile (SRAM) with modified fins. New Flight Control Electronics (FCE) for the fins are housed in the interstage which interfaces with the Upper Stage (U/S) Structural tests of the interstage and the modified fins were started September 82.

(U) Missile level qualification tests are to be completed during FY 83. Detailed test planning is in progress to define schedules and resources. Additionally, a model survey will be conducted on the assembled missile and the carrier aircraft equipment (CAE) during this period. Final limit and ultimate load structural tests on the structural test missile will start in November 82.

(U) Component-level testing of the miniature vehicle (MV) Flight Sensor Assembly (FSA) was conducted in early FY 81. The FSA performance demonstration showed that the sensor will meet performance requirements and that the two-laser test method will measure performance adequately. The two-laser method will be validated against a "black-body" at the Arnold Engineering Development Center (AEDC). Testing of early production models of the sensor processing electronics revealed excessive noise. The equipment is in the redesign phase at this time. Another anomaly observed was a different detector dielectric relaxation effect than predicted. Mission simulations of the result of this effect indicate that system accuracy can be preserved by selection of the proper detector operating conditions. In FY 82, the MV "Mini Qual" tests were performed under expected shock, vibration and temperature environments. A mechanical failure of one of the printed circuit boards was experienced. The component has been redesigned and testing is under way. A radar beacon transponder was added to the MV design to provide better radar tracking during flight testing. This change necessitated an increase in thrust from the Attitude Control Assembly due to the resulting change in mass property. The modified engineering unit is in test. Starting in May 83, an MV flight sensor will undergo parametric and environmental tests in a helium cooled vacuum chamber at AEDC.

(U) The Antisatellite (ASAT) Mission Control Center (MCC) calculates mission parameters used to guide and control an ASAT intercept against a selected target. The MCC is located at NORAD Cheyenne Mountain Complex (NCMC) and is comprised of an IBM 4341 computer with relevant mission planning and communication software, communication links to Vandenburg and Edwards Air Force bases, interfaces with the NORAD Communication Services Subsystem (CSS) and Space Computation Center (SCC). An IBM 4341 has been installed at the NCMC and is currently undergoing vendor acceptance tests. The MCC mission planning computer program (MPCP) was developed by Boeing and Vought at the Program Generation Center (PGC) in Seattle. Verification testing of the MPCP is under way. Formal MPCP validation testing and data base authentication has been started. Communications and other interface software for the NCMC were also developed in the PGC. Interface tests between the PGC and the NORAD Off-Site Test Facility (OSTF) have been in progress since May 82 and all communication protocol problems have been resolved. Integration tests of the operational SCC and CSS with the MCC are scheduled for January 83. Since the OSTF is a high fidelity emulation of SCC and CSS, remaining integration problems should be minimal.

Budget Activity: Strategic Programs #3
Program Element: #64406F, Space Defense Systems (Antisatellite)

The antisatellite (ASAT) flight test program is designed to be a combined Development Test and Evaluation and an Initial Operational Test and Evaluation (DT&E/IOT&E) program. It is comprised of an interlaced series of captive carry flight tests and livefire (free) flight tests. Captive carry tests begin[ ]with a total of 125 hours of flight time. [ ]live-fire launches are planned beginning[ ]and ending[ ]

A Captive Flight Test Missile (CFTM) has been provided for the captive carry flight program. This missile is functionally equivalent to the Flight Test Missile (FTM). In the CFTM, the miniature vehicle (MV) is replaced by an emulator which has the same mass properties and electrical interfaces as an actual MV. CFTM pyrotecnics and propulsion are inert. The CFTM is presently in assembly and checkout. Tests and procedures developed for the CFTM are directly applied to assembly and checkout of the[ ]procured for the program.

(U) The captive carry flight program has as objectives the assessment of F-15 performance with the ASAT missile mated, evaluation of the navigation function of the missile, evaluation of the pilot/ASAT system interaction, and assurance of test-range readiness for live-fire launches. Vibration and acoustic characteristics of the F-15/ASAT system will be ascertained beginning with the first flight in December.

Extensive planning is in progress for[ ]live-fire missile tests. The first live-fire flight test will be with the[ ] The objective of this test will be to[ ]at a designated site. This test will also be used to verify the capabilities of the Western Test Range (WTR) at Vandenberg Air Force Base to support data acquisition during subsequent tests. The[ ]flight is scheduled to be not later than[ ]

The second live-fire test objective will be to expose the MV Flight Sensor Assembly (FSA) to the space Long Wavelength Infrared (LWIR) and the system self-induced environment. This flight will provide data on infrared phenomena not obtainable by ground testing. [ ]

Budget Activity: Strategic Programs #3
Program Element: #64406F, Space Defense System (ASAT)

2. Operational Test and Evaluation: The initial operational test and evaluation (IOT&E) of the air-launched antisatellite (ASAT) system of the Space Defense System Program (SDSP) will be conducted by the Air Force Test and Evaluation Center (AFTEC), with personnel and assistance from the Aerospace Defense Center (ADC)/Space Command, Tactical Air Command (TAC), Strategic Air Command (SAC), Air Force Logistics Command (AFGL), Air Force Communications Command (AFCC), and Air Training command (ATC) as part of a combined Development Test and Evaluation/Initial Operational Test and Evaluation (DT&E/IOT&E) program. IOT&E will provide test information to support scheduled decision milestones and to support a declaration of initial operational capability. More specifically, IOT&E will evaluate the effectiveness and suitability of the ASAT system and the capability of surveillance, command and control, and communications systems to provide adequate support. Test and evaluation is currently scheduled to commence in[ ]and is expected to be complete approximately[ ]

a. (U) IOT&E will accomplish the following major objectives. Evaluate:

(1) (U) The capability of the surveillance sensors to collect and provide ephemeris data on designated targets with the required degree of accuracy and timeliness.

(2) (U) The capability of command and control elements to perform all required functions, to include decision making, and dissemination of execute, recall, terminate and other commands.

(3) (U) The capability of the communications systems to pass required information between system elements in an accurate and timely manner.

(4) (U) The capability to launch the ASAT missile from the F-15 aircraft within required accuracy and timeliness contraints.

(5) The capability of the MV to acquire the target and accomplish negation[ ]

(6) (U) System suitability, to include availability, reliability, maintainability, logistic supportability, and compatibility with other systems.

b. The IOT&E will be accomplished through evaluation and demonstration of the various system segments and tests of the entire system. Segment tests will evaluate the performance capabilities of individual system segments such as surveillance sensors, command and control elements, communications systems, etc. System testing will involve dry runs to exercise and evaluate all system segments to the point of weapon launch. Live fire testing, under the direction of the Air Force Systems Command (AFSC), will involve all segments and include launching the weapons against an instrument test vehicle (ITV). In addition, up to[ ]launches will be planned against resident space objects. Air Force Test and Evaluation Center (AFTEC) will independently evaluate live-fire test data and will use simulation and analyses to supplement live-fire test results.

Budget Activity: Strategic Programs, #3
Program Element: #64406F, Space Defense Systems (Antisatellite)

c. Prototype weapons and equipment, developed by Boeing and Vought Corporations, will be used for testing during development test and evaluation/initial operational test and evaluation (DT&E/IOT&E). The prototype is expected to be subsequently deployed to achieve a limited operational capability in[ ]

d. (U) Primary test team elements will be located at Edwards AFB, CA, and the North American Air Defense Command (NORAD) Cheyenne Mountain Complex (CMC), CO. Captive-carry and other segment tests will be conducted on the Air Force Flight Test Center (AFFTC) range. Other captive-carry, dry run and live fire tests will involve flying from Edwards AFB to the Western Test Range (WTR) near Vandenberg AFB, CA, where flight tests will be monitored by WTR sensors. The Air Force Satellite Control Facility (AFSCF) will also contribute by controlling and tracking the instrumented test vehicles. Evaluators located in the NORAD COC will evaluate mission operations center actions.

e. (U) The program was restructured in April 1982 to reduce the schedule and technical risk. The number of test articles to be available for testing was increased to the following quantities:

(1) (U) One point in space launch.

(2) (U) One infrared (IR) probe launch.

(3) [ ]live-fire launches to intercept ITVs.

(4) (U) Two modified aircraft with associated pylons, carrier aircraft equipment, support equipment, etc.

(5) (U) Detailed simulation model of weapon performance from launch of the missile from the aircraft to intercept.

(6) [ ]ITVs to support live-fire tests.

(7) (U) A minimum of 93 captive-carry hours.

f. (U) Reliability, availability and maintainability (RAM) test and evaluation will be conducted using resources available, support and test support equipment, and captive-carry missions. RAM goals have not yet been established. Initial evaluations will assume contractor maintenance and support for the life of the system; however, AFTEC and AFSC will perform "blue suit versus contractor" evaluations to recommend the proper mix of blue suit and contractor maintenance personnel.

Budget Activity: Strategic Programs #3
Program Element: #64406F, Space Defense System (Antisatellite)

3. (U) System Characteristics: Prototype Flight Test Missile (PFTM)

(U) First Stage: Standard Short Range Attack Missile plus antisatellite (ASAT) modifications including two fixed fins, three modified variable fins, and Flight Control Electronics.

		Objective	Current	Method
- Weight (Total)	(Pounds)	1723	1714	Measurement
- Thrust	(Pounds)	7511	7511	Ground Test
- Temperature	(Degrees Fahrenheit)	-65 to +145	-65 to +145	Environmental Test
- Total Impulse	(Pound-Seconds)	255,000	255,000	Ground Test

(U) Second Stage: Standard ALTAIR III with minor structural modifications, reaction control system, and Missile Guidance Assembly. Weight is as attached to Lower Stage prior to flight and includes Miniature Vehicle/Dispenser.

		Objective	Current	Method
- Weight (Total)	(Pounds)	983	1003	Measurement
- Thrust	(Pounds)	5650	5650	Ground Test
- Temperature	(Degrees Fahrenheit)	40 - 100	40 - 100	Ground Test
- Total Impulse	(Pound-Seconds)	173,000	173,000	Ground Test

Miniature Vehicle

		Objective	Current	Method
- Sensor	Long Wavelengh Infrared			
- Weight	(Pounds)	[ ]	[ ]	Measurement
- Dimensions	(Inches)	[ ]	[ ]	Measurement
- Destruct Mechanism		[	] -	Flight Test

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 64711F
DOD Mission Area: #113 - Airborne Strike

Title: Systems Survivability (Nuclear Effects)
Budget Activity: #3 - Strategic Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	11,805	12,836	11,821	14,232	Continuing	N/A
2485	S/V Assessment of C^3 Systems	2,100	2,000	2,000	2,400	Continuing	N/A
3763	S/V Assessment of Aerospace Systems	5,805	7,500	6,260	7,832	Continuing	N/A
4695	S/V Assessment of Satellites	3,900	3,336	3,561	4,000	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The thrust of this program is to assess, through analysis and testing, the effects generated by a nuclear weapon on the survivability/vulnerability (S/V) of Air Force aerospace systems (aircraft, missiles), command and control communications (C^3) systems and satellites, and to develop the engineering technology for hardening these systems.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	12,055	13,948	17,361	N/A	Continuing	N/A

(U) Project 2485 adjusted by 700 due to shift in the start of a data base development effort to FY85. Project 3763 adjusted by 4,342 due to reduced support requirements for the Defense Nuclear Agency(DNA)/Multi-Agency Cooperative Electromagnetic Pulse (EMP) Hardening Technology Program and a delay in the start of the effort to develop advanced EMP hardening techniques. Project 4695 adjusted by 800 in FY84 due to a shift in the start of a hardened satellite point design effort to FY85.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

5. (U) RELATED ACTIVITIES: This Program is related to Air Force programs to develop and maintain a survivable strategic force with associated command and control communications systems. Related porgrams are: Program Element 64747F/Project 1209, Nuclear Effects Simulation Test Facilities; Program Element 62601F/Project 8809, Nuclear S/V Technology; Program Element 63438F, Satellite Systems Survivability; and Program Element 63244F, Aircraft Non-nuclear Survivability. Test facilities for this program are acquired under Program Element 64747F/Project 1209. A joint working group between the Air Force, the Defense Communications Agency, and DNA has been established to coordinate C^3 assessment plans and to effect timely exchange of results. USDRE has established a Joint DNA/Multi-Agency Cooperative EMP Hardening Technology Program to coordinate the efforts of DNA and the services in developing EMP hardening technology.

Program Element: 64711F — Title: Systems Survivability (Nuclear Effects)
DoD Mission Area: #113 - Airborne Strike — Budget Activity: #3 - Strategic Programs

6. (U) WORK PERFORMED BY: The program is managed by the Air Force Weapons Laboratory, Kirtland AFB, NM. Contractual work is performed by: Mission Research Corporation, Santa Barbara, CA; Lockheed Palo Alto Research Laboratory, Palo Alto, CA; Dikewood Corporation, Albuquerque, NM; Harvard University, Cambridge, MA; Virginia Polytechnic Institute, Blacksburg, VA; Texas Technological University, Lubbock, TX; University of Michigan, Ann Arbor, MI; Weidlinger Associates, Menlo Park, CA; TRW Incorporated, Redondo Beach, CA; New Mexico Institute of Mining and Technology, Socorro, NM; University of New Mexico, Albuquerque, NM; Applied Research Associates, Incorporated, Albuquerque, NM; Computer Science Corporation, Falls Church, Va; BDM, McClean, VA; R&D Associates, Marina Del Rey, CA.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 84:

A. (U) PROJECT 2485, SURVIVABILITY/VULNERABILITY (S/V) ASSESSMENT OF COMMAND AND CONTROL COMMUNICATIONS SYSTEMS: This project develops, acquires and uses assessment techniques and Electromagnetic Pulse (EMP) test data to determine the nuclear S/V of critical ground C^3 systems, and develops and evaluates techniques for hardening these systems. During FY 82 validation of the survivable groundwave communications network concept was completed; development of a high altitude radiation detection system was completed; site surveys of two Pave Paws sites were conducted t identify EMP protection deficiencies; EMP hardness verification for satellite ground terminals was initiated; and development of fiber optics as an EMP hardening technique was continued. In FY 83 EMP hardness verification for satellite ground terminals will continue; the development of fiber optics as a hardening technique will continue; and a test of the EMP shielding for the USAFE Operations Support Center will be conducted. In FY 84, system propagation analyses will be conducted; development of fiber optics hardening techniques will be continued; and assessment of the EMP hardness of ground facilities will be continued.

B. (U) PROJECT 3763, SURVIVABILITY/VULNERABILITY ASSESSMENT OF AEROSPACE SYSTEMS: This project determines through analysis and testing the nuclear S/V of aerospace systems (aircraft and missiles) and associated structures, and develops and evaluates techniques for hardening these systems. During FY 82, EMP testing of the FB-111 was completed; support was provided on the EMP assessment of the B-52; investigations into the similarity of lightning and EMP were initiated; development of life cycle survivability programs for aircraft and missiles continued; and analysis of the response of structures to blast and shock continued. In FY 83, work will begin to acquire a test bed aircraft to develop and verify EMP hardening techniques for aircraft; development of a combined Electromagnetic Interference (EMI)/Electromagnetic Compatibility (EMC)/EMP/lightning standard will begin; support of EMP testing of aircraft/missile systems and fiber optics systems will continue; testing of the response of structures to blast and shock will be initiated; alternate S/V assessment methodologies will be developed; and development of a hardness assurance monitoring system (HAMS) will continue. In FY 84, support will be provided for the EMP testing of the E-4B; a major effort to develop advanced EMP hardening techniques will be initiated development of an EMI/EMC/EMP/lightning standard will continue; testing of a HAMS will begin; and the testing and analysis of the response of structures to blast and shock will continue.

C. (U) PROJECT 4695, SURVIVABILITY VULNERABILITY ASSESSMENT OF SATELLITES: This project develops the technology and engineering capability required to assess and support nuclear S/V hardening of satellites and satellite communications networks and provides nuclear S/V assistance to the product divisions and the operating commands. In FY 82, system generated EMP (SGEMP) testing of the Fleet Satellite Communications was completed; development of the constrained design approach to satellite hardening continued; assessments of the MILSTAR and Global Positioning Satellite (GPS) were initiated; and analysis of satellite link performance continued. In FY 83, support of the MILSTAR and GPS programs will continue; analysis of satellite link performance and development of satellite link hardening techniques will continue; SGEMP testing will continue and SGEMP hardening guidelines will be developed; and the development and verification of the constrained design approach will continue. In FY 84, an effort will be initiated to improve satellite hardening and assessment techniques for SGEMP and electron caused EMP; verification of the constrained design approach will continue SGEMP testing will continue with emphasis on the testing of large area objects; development of satellite link hardening techniques will continue; and efforts to improve the project's testing capability will be initiated.

8. (U) PROJECTS OVER $10 MILLION IN FY 84: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #11113F
DOD Mission Area: # 113, Airborne Strike

Title: B-52 Squadrons
Budget Activity: Strategic Programs, #3

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	92,676	91,076	86,892	41,755	Continuing	N/A
2405	Strategic Avionics Crewstation Design Evaluation Facility	1,700			855	Continuing	N/A
2406	B-52 Offensive Avionics Systems	25,239	13,700	2,600	3,100		230,582
2548	Nuclear Hardness Pulse/ Electromagnetic	1,800		8,000	12,000	10,000	75,400
2570	Electronic System Test Set	5,193					53,293
2571	B-52 Aircraft Modernization Program	12,849					28,649
2601	Strateg Radar Update	21,850	70,000	45,900	4,900		149,536
2632	Offensive Avionics System/ Cruise Missile Integration Weapon System Trainer Modification	2,553	1,400	5,500	9,200		31,753
2633	B-52H Cruise Missile Integration	1,000					1,000

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Program Element: #11113F Title: B-52 Squadrons

DOD Mission Area: # 113, Airborne Strike Budget Activity: Strategic Programs, #3

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
2692	Autopilot Upgrade	9,900		19,300	5,700		47,200
2787	Conventional Standoff Capability	3,900	1,076	3,492			8,468
2824	Mission Data Preparation	1,692	4,900	2,100	6,000		16,492
1995	Counter SUAWACS	5,000					5,000

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The purpose of the B-52 Squadrons program is to maintain the operational effectiveness of the B-52 force. Aircraft subsystems are becoming increasingly difficult to support and require reliability/maintainability updates to maintain force effectiveness, reduce support costs, and to achieve the required probability of mission completion. The programmed updates provide a reliabile, operationally effective system.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	95,639	121,767	82,105	Continuing	N/A
Procurement (3010)	388,600	528,800	910,700	2,054,800	4,812,700

A. (U) RDT&E Differences:

(1) (U) FY 1982: An additional $3.0 million was reprogrammed into the Program Element to fund the B-52G/Harpoon missile demonstration scheduled for March 1983. This demonstration responds to Defense Guidance that a long-range maritime capability be initiated by the Air Force.

Program Element: #11113F | Title: B-52 Squadrons
DOD Mission Area: # 113, Airborne Strike | Budget Activity: Strategic Programs, #3

(2) (U) FY 1983: The reduction of $31.767 million reflects Congressional reduction from the original request. As a result, project funding was realigned with emphasis on highest priority project, Strategic Radar Update. An additional $1.1 million was reprogrammed into the Program Element by the Office of the Secretary of Defense (OSD) to fund B-52G/Harpoon wind tunnel tests and aircraft integration.

(3) (U) FY 1984: The estimate increase of $13.3 million reflects realignment of projects as a result of FY 1983 reduction as well as a negotiated Strategic Radar Update contract versus previous government estimates. An additional $3.5 million provides for Harpoon weapon certification tests and B-52G integration.

B. (U) Procurement Differences:

(1) (U) FY 1982: The reduction of $10.4 million reflects elimination of the Observable Difference modification for the B-52H and repricing of the OAS contract.

(2) (U) FY 1983: Reduction of $36.6 million reflects repricing of Cruise Missile Carriage and Radar antenna modifications plus slight increases in OAS and FQIS/ECS modification.

(3) (U) FY 1984: The significant reduction in estimated procurement from the FY 1983 Summary are mainly attributed to the "softness" of cost estimates for the internal ALCM carriage modification. The reduction of almost $247 million reflect more recent data. Additionally, OAS modification reductions reflect repricing due to negotiated contract options.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

Procurement (3010)*	378,200	487,400	540,500	499,500	883,800	2,789,400
Operation and Maintenance (3400)	30,000	50,600	36,100	34,400	87,100	242,600

*Includes Initial Spares

Program Element: #11113F　　　Title: B-52 Squadrons

DOD Mission Area: # 113, Airborne Strike　　　Budget Activity: Strategic Programs, #3

Cruise Missile Carriage, B-52G/H	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Procurement (3010)*	78,700	119,500	226,000	285,100	357,800	1,286,100
(Quantity)	(40)	(41)	(27)	(28)	(-)	(201)
			(22)**	(23)**	(51)**	(96)**
Operation & Maintenance/Installation						
(3400/540)	2,400	3,900	4,200	1,700	8,900	21,300
(Input)	(26)	(40)	(37)	(17)	(78)	(201)
(Output)	(14)	(40)	(41)	(16)	(90)	(201)
Offensive Avionics System, B-52G/H						
Procurement (3010)*	268,500	313,600	173,800			1,440,200
(Quantity)	(61)	(64)	(41)			(266)
Operation & Maintenance/Installation						
(3400/540	27,600	46,600	27,500	24,600	17,100	177,500
(Input)	(38)	(62)	(63)	(60)	(38)	(266)
(Output)	(17)	(61)	(60)	(59)	(63)	(266)
B-52G/H Strategic Radar Update						
Procurement (3010)*		12,000	86,000	138,000	301,600	525,600
(Quantity)			(2)	(57)	(207)	(266)
Operation & Maintenance/Installation						
(3400/540)				100	25,900	26,000
(Input)				(2)	(264)	(266)
(Output)					(266)	(266)

* Includes Initial Spares
** Internal ALCM Carriage

Program Element: #11113F Title: B-52 Squadrons
DOD Mission Area: # 113, Airbrone Strike Budget Activity: Strategic Programs, #3

Aircraft Modernization Program
Fuel Quantity Indicating System Update
Environmental Control System Update

Procurement (3010)*	31,000	42,300	42,700	37,500	60,600	214,100
(Quantity) FQIS	(38)**	(62)**	(63)**	(62)	(43)	(268)
& ECS	(1)	(34)	(63)	(62)	(108)	(268)
Operation and Maintenance/Installation (3400/540)		100	4,400	7,800	35,200	47,500

Autopilot Upgrade

Procurement (3010)*				15,100	39,800	55,500
(Quantity)				(18)	(250)	(268)
Operations & Maintenance/Installation (3400/540)				200	3,400	3,600

B-52 Electromagnetic Pulse

Procurement (3010)*			12,000	23,800	124,000	159,800
(Quantity)			(15)	(60)	(191)	(266)

*Includes Initial Spares

5. RELATED ACTIVITIES: In fiscal year 1982, the Congress directed $5 million in research and development funds for development of a nonlethal Counter Soviet Airborne Warning and Control System (SUAWACS) program. Development is continuing under PE 64738F. [

] The Common Strategic Rotary Launcher (CSRL) program, PE 63258F, provides for the development of a multipurpose launcher, common to the B-52H, B-1B, and the

Program Element: #11113F — Title: B-52 Squadrons
DOD Mission Area: 113, Airborne Strike — Budget Activity: Strategic Programs, #3

Advanced Technology Bomber (ATB). The common launcher will provide internal carriage and launch capability for the Short Range Attack Missile, the Air Launched Cruise Missile, as well as the B-28, B-61, and B-83 gravity weapons. Growth weapons such as the Advanced Cruise Missile, Medium Range Air-to-Surface Missile, Conventional Standoff Weapon, and Harpoon will be accommodated in the CSRL design. Procurement of the launchers will be funded under the respective weapon system program elements.

6. (U) WORK PERFORMED BY: The original avionics study which identified avionic subsystems requiring upgrading under t program was accomplished by Boeing Military Airplane Company. The development program has been awarded to them on a sole source basis. The major subsystems/subcontractors were selected by Boeing Military Airplane Company with Air Force approval. The list of contractors is as follows:

Prime Contractor:	Product:
Boeing Military Airplane Company, Wichita, Kansas	Offensive Avionics System

Major Subcontractors for Offensive Avionics System	Product:
Lear Siegler, Grand Rapids, Michigan	Attitude and Heading Reference System
Sperry Flight Systems, Phoenix, Arizona	Controls/Displays
International Business Machine, Owego, New York	Processor
Norden, Norwalk, Connecticut	Radar Modification
Honeywell, Minneapolis, Minnesota	Radar Altimeter
Honeywell, St. Petersburg, Florida	Inertial Navigation Set
Softech, Waltham, Massachusetts	Jovial 3B Compiler
Sundstrand, Redmond, Washington	Data Transfer Unit, Data Transport Devices
Teledyne - Ryan, San Diego, California	Doppler Velocity Sensor

Associate Contractors on Offensive Avionics System	
Boeing Aerospace Co, Seattle, Washington	Air-to-Ground Missile-86 Cruise Missile

Program Element: #11113F   Title: B-52 Squadrons
DOD Mission Area: 113, Airborne Strike   Budget Activity: Strategic Programs, #3

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: 2405, Strategic Avionics Crewstation Design Evaluation Facility (SACDEF): The Strategic Avionics Crewstation Design Evaluation Facility ground tests new avionics systems required by Strategic Air Command and accomplishes human engineering studies prior to avionics flight testing. Subtasks include ground checkout of systems with Strategic Air Command (SAC) crewmembers prior to flight test programs. In FY 1982, the SECDEF completed simulator hardware installation and modification of the B-52 flight station for baseline study of avionics upgrades. Additionally, they provided offensive avionics system training for SAC and Logistics Command flight test crews. There are no projected requirements in FY 1983 or FY 1984.

B. (U) Project: 2406, Offensive Avionics System (OAS): The B-52 Offensive Avionics System project responds to the immediate need to improve the performance of the B-52G/H bombing navigation system, to reduce avionics system support costs, and to integrate cruise missile carriage on the B-52G. The urgency of the need for improved performance and cruise missile carriage, tempered by the desire to effect significant Operational and Support cost savings shapes the priorities of this project.

(U) The Offensive Avionics System project includes an improved heading system; integrated controls and displays; a reliability modification to the present forward looking radar; a high accuracy inertial navigation system; the additio of digital processing and a new data bus; and a new doppler and radar altimeter. As well as accommodating cruise missile carriage, the new avionics developed under the Offensive Avionics System project provides stored data and integrated sensor updates to the missiles (Air Launched Cruise Missile and Short Range Attack Missile) prior to launch from the aircraft. Precision initialization is required prior to launch of Air Launched Cruise Missile to insure a high probability of acquiring the first terrain correlation matching guidance update point. Other benefits to the cruise missile are a two-fold increase in system reliability and nuclear hardness to electromagnetic pulse/transient radiation effects on electronics.

(U) In FY 1982, integration and testing was completed on Block One software for the Offensive Avionics System (OAS) and Phase B software for the Air Launched Cruise Missile (ALCM). Nuclear weapons certification was completed and the test aircraft transitioned to the Strategic Radar update project. In FY 1983, the first B-52G squadron modified with the OAS and ALCM achieved Initial Operational Capability in December 1982. OAS Block Two software development began and continues through FY 1984 with integration and test. Block Two update incorporates deficiency corrections identified during testing as well as improved ALCM capabilities.

Program Element: #11113F Title: B-52 Squadrons
DOD Mission Area: 113, Airborne Strike Budget Activity: Strategic Programs, #3

C. Project 2548, Nuclear Hardness/Electromagnetic Pulse (EMP): Using FY 1981 Supplemental funds, system level testing on the Dipole and Trestle facilities were accomplished. The tests verified assumptions made on previous tests of an unmodified B-52G, evaluated the results of EMP hardening of the OAS/ALCM equipment, and determined the effects of the installation of the OAS/ALCM on mission essential retained equipment.

D. (U) Project 2632, Offensive Avionics System/Cruise Missile Integration Weapon System Trainer Modification In FY 1982, development completed incorporating the Block Zero software into the Weapon System Trainer (WST). The B-52 Offensive Avionics System (OAS) program is updating OAS software from Block Zero to a Block One configuration. Additionally a Block Two update is being developed in FY 1983. The FY 1983 and 1984 funds incorporate the Block One and Two updates to the WST to maintain configuration compatibility between the aircraft and the WST.

E. (U) Project 2824, Mission Data Preparation System (MDPS): The existing MDPS includes two separate OAS and ALCM application software modules developed under separate programs. As a result of the dual developments, known inefficiencies exist in the application software. These include non-integrated OAS and ALCM software, duplicated data bases, and inconsistent screen formats between OAS and ALCM software. Due to these existing inefficiencies in the current MDPS, additional development and acquisition efforts are required to deliver a data management system that fulfills the requirements of the user.

(U) Initiation of Phase Two application software development began in FY 1982 for optimized B-52 OAS and ALCM utilization. Development includes integration of a data based management system. Continued development of the data based management software will occur in FY 1983 and 1984 with delivery in FY 1985.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: 2601, Strategic Radar Update

A. (U) Project Decription: Project provides a critically needed radar update which is significantly less complex than the original Electronically Agile Radar program but which meets the reliability, maintainability, and supportability problems of the current aging system. The radar, in its present state, is the greatest contributor to an unsatisfactory daily B-52 incommission rate. For example, the fully mission capable rate has decreased nearly 20% since 1979. The programmed update provides an accurate, reliable, operationally effective radar essential for inertial navigation system and cruise missile alignment.

Program Element: #11113F | Title: B-52 Squadrons
DOD Mission Area: 113, Airborne Strike | Budget Activity: Strategic Programs, #3

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Initial Full Scale Engineering Development completed and Full Scale Development began. Tasks included identification and laboratory testing of selected radar modifications as well as software development and test. Preliminary Design Review completed in September 1982.

(2) (U) FY 1983 Program: The Full Scale Engineering Development phase will be completed through Critical Design Review and qualification testing will be initiated. Prototype installation and integration will be checked in the Systems Integration Laboratory and Test Facility. Procurement of kit proof assets as well as accelerated procurement of antenna components to protect the fiscal year 1985 support date is programmed this year.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Component qualification testing will be completed. The updated radar package will be installed into the flight test aircraft and integrated with other modification upgrades. Flight testing from the Boeing Military Airplane Company facilities in Wichita, Kansas will begin in December 1983 and continue through the third quarter of the fiscal year. Funds include development of Depot Level support equipment necessary for organic capability. Modification kit procurement also begins this year.

(U) A Fixed Price Incentive contract was signed in September 1982 with the Boeing Military Airplane Company for the development program. Funding includes negotiated contract plus government costs.

(4) (U) Program to Completion: Project will complete with evaluation of flight test data, deficiency corrections, if any, and test aircraft demodification.

C. (U) Major Milestones:

Milestones	Dates
1. SAC SON 6-75	June 1975
2. Preliminary Design Review	August 1982
3. Critical Design Review	December 1982
4. Start Flight Testing	December 1983
5. Complete Flight Testing	June 1984
6. Start Aircraft Modification	September 1985

Program Element: #11113F
DOD Mission Area: 113, Airborne Strike

Title: B-52 Squadrons
Budget Activity: Strategic Programs, #3

9. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project 2692, Autopilot Upgrade

A. (U) Description: The basic B-52 autopilot technology dates back to World War II. In the early 1960's, its functions were expanded to include the Low Level and Aerial Refueling modes. The Mean Time Between Failure for the existing system is about 15 hours. The age of the autopilot has made it extremely difficult and costly to maintain. The autopilot has been plagued with unscheduled pitch up/down on Low Level and Aerial Refueling modes, roll wallow, erratic aerial refueling operation, and yaw oscillations. Of particular concern are the extremely narrow safety margins in the Low Level and Aerial Refueling modes. The project will provide autopilot updates which will improve reliability, maintainability, and safety to an acceptable level. It provides a new line replaceable unit combining the functions of several existing units that are high failure items and contains model pitch channel with appropriate comparators.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Phase Two of the Initial Full Scale Engineering Development was completed by Air Force Systems Command through Preliminary Design Review. Project transitioned to Air Force Logistics Command to complete development and integration.

(2) (U) FY 1983 Program: Because of reductions in FY 1983 RDT&E request, the autopilot project was deferred to FY 1984 for completion.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Development will continue by the Oklahoma City Air Logistics Center through Critical Design Review. Tasks evolve around development of a single channel digital system combining several existing line replaceable units into one line replaceable unit. Emphasis will center around reliability and supportability with built-in-test capabilities.

(U) Funding is based on May 1982 contractor estimates plus government costs.

(4) (U) Program to Completion: Development will complete in first quarter of FY 1985 and modification kit procurement will begin. Aircraft modification will begin in FY 1986.

Program Element: #11113F Title: B-52 Squadrons
DOD Mission Area: 113, Airborne Strike Budget Activity: Strategic Programs, #3

C. (U) Major Milestones:

Milestones	Dates
1. Definition/Trade Studies	FY 1982
2. Flight Test	FY 1985
3. Modification Start	FY 1986

(U) Milestone 2 and 3 slip one year from 1983 Descriptive Summary, reflecting one year deferral of project funding.

Budget Activity: Strategic Programs #3
Program Element: 11113F - B-52 Squadrons, Project 2406, B-52 Offensive Avionics System (OAS)

Test and Evaluation Data

1. (U) Development Test and Evaluation: The Offensive Avionics System test program is a combined Development Test and Evaluation/Initial Operational Test and Evaluation effort extending to October 1982. The flight testing portion began in September 1980 with completion in October 1982. Between October 1981 and April 1982, combined OAS and Air Launched Cruise Missile (ALCM) testing continued with four ALCM launches using Block Zero software. During the remainder of fiscal 1982, the test aircraft was modified with a third avionics control unit and configured with Block One software culminating in three ALCM launches and live gravity weapon releases.

(U) The objective of the B-52 Offensive Avionics System program was to test and evaluate the operational effectiveness and operational suitability of the selected Offensive Avionics System package including the integration of the Air Launched Cruise Missile and Short Range Attack Missile. The test environment represented the actual combat conditions as close as possible using a modified B-52G. Operational deficiencies were identified and changes/tradeoffs recommended. Information was provided for refining training concepts, tactics, techniques and doctrine, updating publications, and refining operating and support cost estimates.

(U) The test team crewmembers were drawn from the mainstream of the Strategic Air Command crew force to provide a realistic appraisal of the new equipment.

(U) The program provided an update to the B-52G/H offensive avionics package. The effort included design, fabrication, and integration of an offensive avionics system for a flight test evaluation program leading to a Class V modification to the B-52G/H fleet.

(U) The new avionics systems included the addition and/or modification of the following systems/capabilities:

a. (U) Attitude and heading reference system - Replace present heading and attitude systems with a more reliable, accurate system.

b. (U) Radar altimeter - Replace radar altimeter with a more reliable system capable of performing terrain correlation.

c. (U) Digital processor(s) - Replace present analog bombing navigation system computers with digital processors providing bombing, navigation, and air launched missile computations.

Budget Activity: Strategic Programs #3
Program Element: 11113F - B-52 Squadrons, Project 2406, B-52 Offensive Avionics System (OAS)

d. (U) Military-Standard-1553A Data Bus - Insure resultant system architecture will meet Air Force digital time division multiplex standard.

e. (U) Controls and displays - Provide necessary controls and displays to ensure proper man/machine interface.

f. (U) Doppler Velocity Sensor - Replace present APN-89A Doppler radar with the common strategic doppler.

g. (U) Mapping radar modification - Modify the present radar system to improve performance, reliability, and maintainability.

h. (U) Inertial navigation capability - Provide an inertial navigation capability sufficient to meet the stated requirements in Strategic Air Command Required Operational Capability 6-75 for a high precision navigator. The capability must be Air Force-qualified and nuclear hardened to stated requirements. No Research Development Test and Evaluation (DT&E) funds are provided for either nuclear hardening or prototype systems other than United States Air Force government furnished equipment.

i. (U) Terrain correlation - Evaluate terrain correlation as a navigational aid in the performance of the strategic mission.

j. (U) Air launched missile(s)/aircraft avionics tie-in - Integrate software/hardware required to support air launched missile delivery.

(U) The development contractor is the Boeing Military Airplane Company in Wichita, Kansas. The DT&E service program manager is the Aeronautical System Division at Wright-Patterson Air Force Base, Ohio. The Operational Test and Evaluation (OT&E) agency is the Air Force Test and Evaluation Center at Kirtland Air Force Base New Mexico. The test location was be the Boeing Wichita plant 13 and the Air Force Flight Test Center, Edwards AFB, California.

(U) Particular emphasis was placed on testing the operational effectiveness of the fault detection/isolation capabilities of the new equipment. Initial Operational Test and Evaluation (IOT&E) test team personnel maintained the updated avionics system using the same available organizational/intermediate level techniques/equipment that are to be used during system deployment.

(U) Preliminary validated technical orders were provided to DT&E/IOT&E test team personnel to perform maintenance associated with the new systems. These technical orders were verified during DT&E/IOT&E to provide final tech data for system deployment.

Budget Activity: Strategic Programs #3
Program Element: 11113F - B-52 Squadrons, Project 2406, B-52 Offensive Avionics System (OAS)

(U) An evaluation of software for the B-52 OAS was performed by the software assessment team at Boeing Military Airplane Company and Oklahoma City-Air Logistics Center (OC-ALC). In the test team, contractor development and test activities, as well as flight testing, were monitored to assess software performance and suitability factors. The effectiveness of software development tools to support future software maintenance was also assessed. At OC-ALC, computer programs and the associated documentation were evaluated to judge their adequacy for software maintenance.

(U) In addition, a limited simulation capability for the OAS computer complex is planned to allow some performance evaluation of OAS Operational Computer Programs. This activity also begins a buildup of Air Force expertise at OC-ALC on which to base future organic support for B-52 OAS software.

(U) A high degree of similarity exists between the items tested during Development Test and Evaluation (DT&E), those tested during Initial Operational Test and Evaluation (IOT&E), and those in the production configuration. Except for minor installation and wiring differences, the subsystems are completely interchangeable. Software will be continually updated with test findings.

(U) Below are sections for special items of concern which were evaluated and affected the Test and Evaluation portion of this program.

a. (U) Reliability:

(1) (U) Primary Mission Equipment shall have a minimum mean time between failure of 43 hours evaluated by burn in, qualification testing, ground tests, and flight tests.

(2) (U) Interface equipment shall have a minimum mean time between failure of 2500 hours.

(3) (U) Aircraft installed equipment shall have a minimum mean time between failure of 400 hours.

b. (U) Maintainability:

(1) (U) The total "on aircraft" maintenance time for new equipment shall not exceed 140 hours per 1000 system operating hours.

(2) (U) The mean time to restore failed equipment "on aircraft" shall not exceed 1 hour.

Budget Activity: Strategic Programs #3
Program Element: 11113F - B-52 Squadrons, Project 2406, B-52 Offensive Avionics System (OAS)

(3) (U) The mean time to restore failed equipment at the intermediate level shall not exceed 1.5 hours.

c. (U) Environmental Qualification Testing:

(1) (U) All new primary mission equipment was tested for explosion proof, temperature shock, temperature-altitude, vibration, shock, acoustics, humidity, sand and dust, fungus, salt atmosphere, moisture, radiation, and overpressure using the appropriate Military-Standard.

(2) (U) Vibration testing included 11 hours of random vibrations at two temperature levels, -55° and 71°C.

d. (U) Test Flights: The program had combined Development Test and Evaluation/Initial Operational Test and Evaluation (DT&E/IOT&E) flights. The DT&E testing included 71 flights.

e. (U) Management: The test and evaluation program management for the OAS and air launched cruise missile integration is described below.

(1) (U) The development portion was a combined DT&E/IOT&E program and continued through the full scale engineering and development contract. The test portion was from September 1980 through October 1982. The overall program manager is the Strategic Systems System Program Office (ASD/YY) who is also in charge of DT&E. Air Force Test Evaluation Center (AFTEC) is responsible for the IOT&E.

(2) (U) Beyond the DT&E/IOT&E program, a Follow-on Operational Test and Evaluation (FOT&E) is planned with two phases. The first phase, October 1982 to July 1983, is the responsibility of AFTEC. Headquarters Strategic Air Command (SAC) will conduct the second phase beginning in August 1983.

2. (U) Operational Test and Evaluation Data:

a. (U) Testing began in September 1980 and concluded 25 September 1981.

b. (U) The test was combined Development Test and Evaluation/Initial Operational Test and Evaluation (DT&E/IOT&E) and used one Offensive Avionivs System (OAS) modified B-52G aircraft which staged from the Boeing Military Airplane Company/McConnell AFB, Kansas facilities. Test ranges used included White Sands Missile Range, Nellis Range, Utah Test and Training Range, and Tonopah Test Range. Boeing Military Airplane Company was the prime contractor. The Air Force Test and Evaluation Center has overall responsibility for the IOT&E. Strategic Air Command (SAC), Air Force Logistics Command, and Air Training Command provided personnel to the test team. The objectives of the IOT&E were to:

(1) Evaluate the operational effectiveness of the OAS-modified B-52 to perform the SAC operational

Budget Activity: Strategic Programs #3
Program Element: 11113F - B-52 Squadrons, Project 2406, B-52 Offensive Avionics System (OAS)

mission (i.e., quick reaction launch, air alignment of the inertial measurement unit, tanker rendezvous, overwater flight, landfall fix, weather aviodance, high and low altitude gravity weapon delivery, simulated and actual missile launch (Short Range Attack Missile/Air Launched Cruise Missile (SRAM/ALCM)), interoperability, and poststrike recovery).

(2) (U) Evaluate the operational suitability of the OAS (i.e., system reliability, maintainability, supportability and availablility). Reliability and maintainability data was collected during in-flight and ground operations of the system and normal maintenance operations. Additional maintainability events were conducted to explore the whole range of normal operational maintenance events.

(3) (U) Identify system characteristics or deficiencies which significantly impact operating and support (O&S) costs. Identify operational deficiencies. Recommend and/or evaluate changes or trade-offs in production configuration. Evaluate the effectiveness of the computational subsystem software, to include functional performance, degraded mode operations, and software man-machine interface.

c. (U) All minor support equipment was evaluated during the test. Minor changes were recommended and made to several items, and two items were completely redesigned. Several items of major support equipment received only cursory evaluations as they were not available until late in the program. Additional evaluations will be performed during follow-on operational test and evaluation (FOT&E). During IOT&E, intermediate-level maintenance was performed largely by the contractor using special test equipment. Estimates of operational reliability and maintainability for this level of maintenance were consequently degraded. Supportability of the test sets will be evaulated during FOT&E.

d. (U) The system and subsystems tested were preproduction configuration. "Patches" to system software were made during the test and included in the operational system. OT&E operations and maintenance personnel were representative of user personnel.

e. (U) With the concurrency of the full scale development and production programs, some long-lead production decisions were made prior to the completion of flight testing. One hundred ship sets of equipment were on contract and the first three aircraft were modified before the test ended.

f. (U) Seventy-four sorties and 640 flying hours were flown in support of the test. Three dedicated IOT&E sorties designed around standard SAC operational missions were flown. In addition two ALCM and two SRAM live launches and four gravity weapon shapes were dropped to compare actual with simulated release activity.

g. (U) Over 150 service reports have been written on system deficiencies. Numerous fixes have been verified and tested; however, some fixes will have to be tested during the FOT&E. Major deficiencies exist in the radar system.

h. (U) Results from this phase of testing are contained in the AFTEC B-52 OAS Final Report, January 1982, (SECRET).

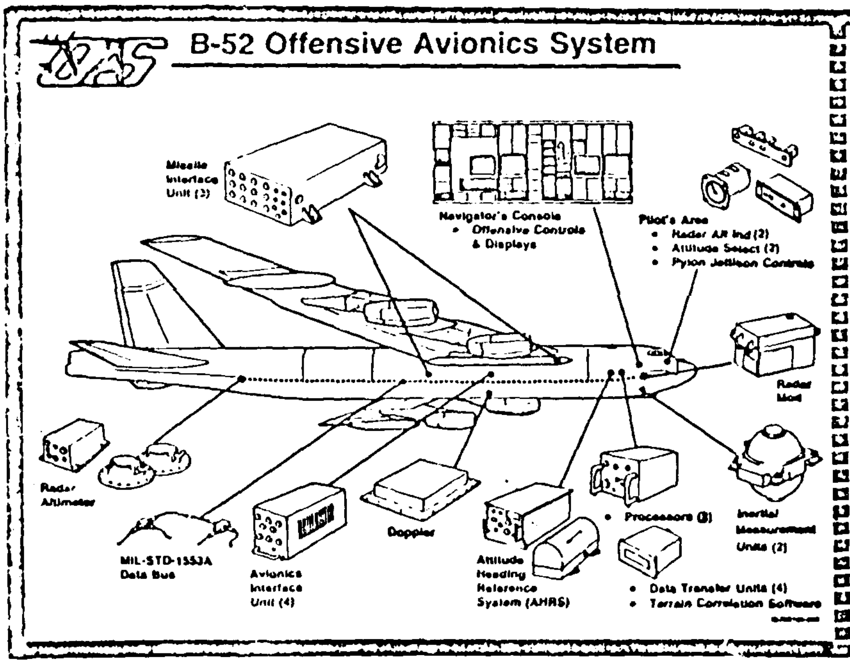
Budget Activity: Strategic Programs #3
Program Element: 11113F - B-52 Squadrons, Project 2406, B-52 Offensive Avionics System (OAS)

i. (U) Continued DT&E/OT&E of the OAS system was conducted at Edwards AFB, CA, from October 1981 - April 1982. This test was combined with ALCM testing to become the Integrated Weapon System (IWS) program. Four ALCM launches were conducted and approximately 20 OAS misisons were flown.

j. (U) The test aircraft was modified with a third avionics processor in May - June 1982 and delivered in July to Edwards for testing of the Block I OAS software update and revision B of the ALCM software package. The test was completed on 15 October 1982. Three ALCM launches and approximmately 20 OAS sorties were performed. The operational suitability evaluation is being conducted ay Griffis AFB, NY, the first operational SAC base for the system. On 16 October 1982, the first phase of IWS FOT&E began under AFTEC management. All ALCM launches after that data will be conducted from Griffis AFB using SAC's operational assets to generate and conduct the missions.

Budget Activity: Strategic Programs #3
Program Element: 11113F B-52 Squadrons, Project 2406, B-52 Offensive Avionics System (OAS)

3. Systems Characteristics: The following are general characteristics of the new offensive avionics system to be modified on the B-52G/H aircraft.



B-52 Offensive Avionics System
WEAPON SYSTEM ACCURACY

	THRESHOLD	DEMONSTRATED
SRAM		
CEP (FT)		
ALCM		
CEP (FT)		
GRAVITY WEAPON		
CEP, HIGH ALT (FT)		
CEP, LOW ALT (FT)		
NAVIGATION		
DRIFT RATE (NM/HR)		

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #11142F — Title: KC-135 Squadrons
DOD Mission Area: #113 - Airborne Strike — Budget Activity: #3 - Strategic Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

·oject ..umber	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimate Cost
	TOTAL FOR PROGRAM ELEMENT	28,880	28,950	11,300	9,401	Continuing	N/A
2214	Improved Aerial Refueling Systems	2,300	2,606	3,000	9,401	Continuing	N/A
2391	Avionics Modernization	1,680	-	-	-	Complete	3,911
2469	KC-135 Modernization	24,900	26,344	8,300	-	Complete	97,200

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The KC-135 provides worldwide air refueling support for strategic, tactical, and airlift forces in both strategic nuclear and conventional roles. Current refueling requirements substantially exceed the capabilities of the current and programmed KC-135/KC-10 force. The KC-135 modernization program will increase its fuel offload capability by 50% and reduce the air refueling shortfall while resolving current performance, maintenance and environmental problems with the current engine. Improved aerial refueling systems will permit safer, more efficient fuel transfer to receivers and develop interoperable refueling systems that will be compatible with NATO/Navy receivers.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	30,000	28,950	11,792		N/A	90,787
Procurement (Aircraft)	246,800(9)	584,600(TBD)	1,341,033(58)		Continuing	5,805,910

RDT&E: FY 1982 - Avionics Modernization Project reduced and terminated. Total Estimated Costs for project 2214 is not estimated due to its continuing level of effort. The Total for Program Element is not estimated for the same reason.

Program Element: #11142F
DOD Mission Area: #113 - Airborne Strike

Title: KC-135 Squadrons
Budget Activity: #3 - Strategic Programs

Procurement: FY 1982 - Funds adjusted to fully fund FY 1981 procurement. FY 1983 - Congressional reduction to requested procurement. FY 1984 - Production buy was reduced and advance procurement added to initiate multiyear procurement in FY 84.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

KC-135 Modernization	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Aircraft Procurement*						
Funds	238,000	469,600	942,400	1,444,400	Continuing	N/A**
Quantities	9	19	31	65		
Installation (PE #72207)						
Funds	2,900	2,400	15,500	30,100	Continuing	N/A**

* Aircraft procurement includes initial spares.

** Total Estimated Costs for program acquisition in FYDP is 7,832,500 (334 aircraft), including 275,300 in associated installation; program planned to continue at 72 aircraft per year until fleet modernization (615 primary aircraft) is complete.

5. (U) RELATED ACTIVITIES: Program element 72207F contains the installation labor funding required for the KC-135 modernization project.

6. (U) WORK PERFORMED BY: The KC-135 modernization program is managed by the Aeronautical Systems Division of the Air Force Systems Command. The prime contractor is the Boeing Military Airplane Company, Wichita, Kansas. The engine manufacturer is CFMI Company, a partnership of General Electric in the United States and SNECMA, a French company.

Program Element: #11142F	Title: KC-135 Squadrons
DOD Mission Area: #113 - Airborne Strike	Budget Activity: #3 - Strategic Programs

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: (#2214 Improved Aerial Refueling Systems) The KC-135 aerial refueling systems, designed in the early 1950s, require improvements for flight safety,, improved efficiency, and maintainability. Development efforts include an improved boom, boom nozzle, boom test equipment, improved hydraulic fuel pumps, and hose reel systems. The hose reel system will be flight tested during 1983. Full scale engineering development will occur in FY 1984 on the hose reel system as well as continued development of low cost solutions to current boom control deficiencies.

B. (U) Project: (#2469 KC-135 Modernization) The KC-135 modernization program is the most cost-effective solution to two problems: the air refueling shortfall and the obsolescence of the current, early 1950 technology engines. The modernized aircraft, named the KC-135R, will have a 50% increase in capability and be able to fly well into the 21st century. Flight testing, which began in August 1982, will continue in 1983. 1984 test and evaluation funding will complete the research and development effort prior to full scale production beginning in May 1984.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: N/A

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #11213F
DOD Mission Area: #111 - Land-Based Strike

Title: Minuteman Squadrons
Budget Activity: #3 - Strategic Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	19,326	10,957	4,956	4,761	Continuing	N/A
	Command, Control, Communications Integration (C^3I)	10,400	4,000				54,000
	Minuteman III Guidance Upgrade	5,500					5,500
	Program Support	3,426	6,957	4,956	4,761	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Minuteman weapon system became operational in the 1960s and now consists of 450 Minuteman II and 550 Minuteman III intercontinental ballistic missiles deployed in hardened underground silos. Minuteman has served as a prime nuclear deterrent force for the United States for 20 years and is projected to maintain this role into the next century. The program element (P.E.) provides improvements and modifications to the Minuteman force to enhance its contribution to strategic deterrence. Improvements underway include integration of new command, control, and communications equipment into Minuteman launch control centers and upgrade of Minuteman III guidance computer software.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	19,626	12,857	5,173	N/A	Continuing	3,945,000
Missile Procurement	111,300	0	31,700	N/A		8,821,900

Difference in RDT&E Total Estimated Cost because this document shows that total cost for a continuing program is not applicable. Difference in FY 1982 Missile Procurement because FY 1983 Descriptive Summary included 57,000 for MK 12A Reentry Vehicle. Difference in FY 1983 Missile Procurement because 6,500 for Guidance Upgrade was carried in the FY 1983 document as a separate project. Difference in Missile Procurement Total Estimated Cost because FY 1983 document showed all costs but this document only shows costs for procurement associated with the RDT&E funding in paragraph 1.

Program Element: #11213F
DOD Mission Area: #111 - Land-Based Strike

Title: Minuteman Squadrons
Budget Activity: #3 - Strategic Programs

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Missile Procurement Total	52,300	6,500	31,888			149,283
C^3I	52,300		30,888			141,783
Minuteman III Guidance Upgrade		6,500	1,000			7,500

5. (U) RELATED ACTIVITIES: Advanced Strategic Missile Systems, P.E. #63311F, is a program which develops subsystems and applies technology having potential application to operational and future intercontinental ballistic missiles. The new strategic missile program, Peacekeeper (M-X), P.E. #64312, is developing systems for the next generation missile. Duplication of effort is avoided by assigning both of these programs and Minuteman development activities to a single organization, the Ballistic Missile Office. Relative to the communications integration program, the three communications systems are each being developed and procured by their respective program elements (616A: P.E. #33131F; AFSATCOM: P.E. #33601F; SACDIN: P.E. #11316F) and the equipment will be delivered to the Minuteman integration program as government furnished equipment for integration into the Minuteman launch control centers.

6. (U) WORK PERFORMED BY: The primary contractors are: The Boeing Company, Seattle, WA (C^3I); GTE Sylvania, Needham Heights, MA (C^3I); Rockwell International, Anaheim, CA (Guidance Upgrade); and TRW, Redondo Beach, CA (Program Support). The responsible Air Force agency is Air Force Systems Command's Ballistic Missile Office, Norton Air Force Base, CA. Air Force Logistics Command's Ogden Air Logistics Center, Hill Air Force Base, UT, is also responsible for the Guidance Upgrade program.

7. (U) PROGRAM SUPPORT (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984):

A. (U) Project Description: This project is a continuing activity and includes funding for systems engineering and technical assistance and all operating costs (collateral testing, analyses, travel, etc.) in support of Minuteman programs at the Ballistic Missile Office. Continuing technical expertise for planning, analysis, design, test, and associate systems engineering support is necessary to develop and prove prototypes of improvements to the operational system in accordance with approved program directions.

Program Element: #11213F DOD Mission Area: #111 - Land-Based Strike

Title: Minuteman Squadrons Budget Activity: #3 - Strategic Programs

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: This project supported deployment of the MK 12A reentry vehicle, provided design support for the integration of the 616A modification to the 487L Survivable Low Frequency Communications System with AFSATCOM and SACDIN, and supported the initial software revisions for Guidance Upgrade.

(2) (U) FY 1983 Program: This project will resolve problems encountered during assembly and checkout of C^3I equipment and will support the Guidance Upgrade and Minuteman Extended Survivable Power programs.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: This project will resolve problems encountered during assembly and checkout of C^3I and Minuteman Extended Survivable Power equipment and will support the Guidance Upgrade program. The cost estimate was arrived at through the use of program office assessments utilizing past acquisition history of similar efforts, Technical Analysis and Cost Estimate studies, and data obtained from program office support functions.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not Applicable.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #11312F — Title: Post Attack Command and Control System
DOD Mission Area: #331-Strategic Command and Control — Budget Activity: #3-Strategic Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0*	0*	6,869	2,347	continuing	N/A

Fiscal Year (FY) 1983 and prior year funding for the E-4 Program is contained in Program Element (PE) 11312F. However, effective with FY 1984, all E-4 funding has been transferred to PE 32015F. Explanations concerning the E-4 Program and funding are contained in the FY 84 RDT&E Descriptive Summary for PE 32015F.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: To provide a survivable command and control facility for the SIOP CINCS that will support the National Command Authority during all phases of a general war. Supports activities currently underway involving all the aircraft of the Worldwide Airborne Command Post System including CINCEUR, CINCSAC, CINCLANT and CINCPAC.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
RDT&E	9,365*	24,034*	34,366*		Continuing	N/A

* The FY 83 Descriptive Summary for PE 11312F documented RDT&E funding for the E-4 Program. However, effective with FY 1984, all E-4 funding has been transferred to PE 32015F. Explanations concerning the E-4 Program and funding are contained in the FY 84 RDT&E Descriptive Summary for PE 32015F.

4. (U) OTHER APPROPRIATION FUNDS: ($ In thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
Procurement (aircraft)		0**	65,500*	104,200*	Continuing	N/A

* These funds are the total 3010 investment funds programmed for Class V modifications to the EC-135 and were formerly included in PE 11142F, KC-135 Squadrons.

Program Element: #11312F Title: Post Attack Command and Control System
DOD Mission Area: #331-Strategic Command and Control Budget Activity: #3- Strategic Programs

** FY 83 and prior year funding for the E-4 Program is contained in PE 11312F. However, effective with FY 84, all E-4 funding has been transferred to PE 32015F. Explanations concerning the E-4 Program and funding are contained in the FY 84 RDT&E Descriptive Summary for PE 32015F.

5. (U) RELATED ACTIVITIES: Strategic Air Command Communications, PE 11316F; Air Force Satellite Communications Program, PE 33601F; System Survivability, PE 64711F; Electromagnetic Radiation Test Facilities, PE 64747F; National Emergency Airborne Command Post, PE 32015F; Air Force Support to Minimum Essential Emergency Communications Network, PE 33131F; the Defense Support Program, PE 12431F; and Integrated Operational NUDET Detection System, PE 12433F.

6. (U) WORK PERFORMED BY: The Worldwide Airborne Command Post System Program Office (WWABNCP SPO) has responsibility for the program. This is an Air Force Logistics Command organization located at Tinker Air Force Base, Oklahoma.

7. (U) Post Attack Command and Control System (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984):

A. (U) Project Description: The Worldwide Airborne Command Post System Program Office (WWABNCP SPO) conducts, on a continuing basis, an *Electromagnetic Pulse (EMP) Engineering* Surveillance program relative to the EC-135. This effort establishes and analyzes EMP design specifications for new systems, supports limited subsystem and component testing, investigates new installation techniques to achieve improved EMP protection and provides a continuing analysis of the EMP survivability of the EC-135. This is a continuing level of effort program.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Current efforts include the development of EMP spec[illegible] for currently installed equipment on the EC-135 fleet. Included in this effort is analysis of [illegible] equipment projected to be installed on the aircraft.

(2) (U) FY 1983 Program: Contractor performed *analysis and* EMP specification *deve*[illegible] scheduled for delivery. Other items to be completed include a revised internal aircraft [illegible] rack layout to improve nuclear effects survivability plus analysis of the applicability of data bus architecture to internal aircraft information processing using fiberoptic cable technology to combat nuclear effects and reduce the weight and space required for cable runs on the aircraft.

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Program Element: #11312F | Title: Post Attack Command and Control System
DOD Mission Area: #331-Strategic Command and Control | Budget Activity: #3-Strategic Programs

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The projected FY84 effort will continue the EMP Engineering Surveillance program with regards to the replacement UHF-LOS system. Additional efforts in the hardening program include analysis of the Regency Net Radio Equipment and commercial secure voice devices intended to be installed on the EC-135 as part of the Class V modification programs. Detailed technical analyses of alterative solutions for a WWABNCP/PACCS replacement system are planned. RDT&E funds in this Program Element (PE 11312F), starting in FY 84, are new funds to support this effort.

(4) (U) Program to Completion: The EMP Engineering Surveillance program is a continuing program, as survivability of the EC-135 fleet must be insured. Specific tasks necessary to conduct this effort will be identified as they occur. Examples of possible tasks include analysis of future upgrade projects designed to keep the WWABNCP fleet compatible with the evolving C3I structure and development of improved airborne C2 systems to improve the message dissemination and force management capabilities of the PACCS system.

C. (U) Major Milestones:

Milestones	Dates
Report due on Equipment EMP Specifications	December 1982
Initial Contract Award for hardened UHF-LOS Replacement	April 1983
Advanced Technology Reports Due from TRW and Boeing	May 1983
Initial Aircraft Installation of UHF-LOS System (PACCS)	June 1984
Initial Aircraft Installation of UHF-LOS System (WWABNCP)	June 1986

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #11316F
DOD Mission Area: #333 - Strategic Communications

Title: SAC Communications
Budget Activity: #3 - Strategic Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	30,434	28,096	15,256	1,597	Continuing	Not Applicable
1136	SAC Digital Network (SACDIN)	30,134	28,096	2,899	261	259	128,260
2869	Aircraft Alerting Communications Electromagnetic Pulse (EMP) (AACE) Upgrade	300	0	12,357	1,336	0	13,993
2969	Emergency Rocket Communications System (ERCS) Replacement	0	0	0	0	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Strategic Air Command (SAC) Digital Network (SACDIN) Program will upgrade and modernize SAC's current (1950's technology) printed copy command and control communications system. SACDIN will provide necessary interfaces to other command/control systems while providing two-way, direct, secure communications with enhanced survivability from the National Command Authorities and the Commander-in-Chief SAC to dispersed missile crew commanders and aircraft wing commanders. The Aircraft Alerting Communications Electromagnetic Pulse (EMP) (AACE) Upgrade Program will provide EMP-hardened communications shelters, consoles and radiation detectors to insure delivery of Positive Control Launch messages and Emergency Action Messages to the bomber crews after a nuclear burst.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
RDT&E	29,489	28,096	188		564	125,081
Procurement, Other	22,268	0	124,751		2,894	149,913

RDT&E:

FY 1982: Difference reflects inclusion of AACE Upgrade Program and support to SACDIN development testing.
FY 1984: $2.711 Million was added to SACDIN for residual development and engineering changes. $12.357 Million added to fund AACE development.

Procurement, Other:

FY 1982: Reduction in SACDIN long-lead parts procurement.
FY 1984: SACDIN re-pricing based on better data, and deflation.

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FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #11316F   Title: SAC Communications
DOD Mission Area: #333 - Strategic Communications   Budget Activity: #3 - Strategic Programs

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Procurement, Other:						
SAC Digital Network	22,122	3,318	128,054	5,401	Continuing	Not Applicable
AACE Upgrade Program						
Funds				14,211	6,678	20,889
Quantities				16	9	

5. (U) RELATED ACTIVITIES: Program Element 11213F will accomplish SACDIN integration into the Minuteman weapon systems. The Defense Data Network (Program Element 33126F) will provide the major network trunking support for SACDIN.

6. (U) WORK PERFORMED BY: Electronic Systems Division, Hanscom Air Force Base, MA (total program management); Mitre Corporation, Bedford, MA (technical support); ITT, Defense Communications Division, Nutley, NJ (SACDIN prime contractor).

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project # 1136, SAC Digital Network.

The SAC Digital Network (SACDIN) Program includes the design, acquisition and implementation of a command and control data communications system for the Commander-in-Chief SAC. The system will significantly improve current communications capabilities from both operational and maintenance standpoints. SACDIN will replace the SAC Automated Total Information Network (SATIN) I computer and key elements of the Data Transmission Subsystem of SAC's Automated Command Control System (SACCS). It will interface with the SACCS Data Display Subsystem. ITT Corporation is the prime contractor with total system performance responsibility. Maximum possible use is being made of off-the-shelf equipment. Modifications to hardware and new hardware/software procurement will be made only where operational requirements demand. In FY 1982, development of all prototype hardware was completed. The hardware completed all qualification testing and has exceeded specifications. All software development tasks were completed except those efforts related to some external interfaces. Initial Operational Test and Evaluation will begin in FY 1983 and full scale production is planned to start in FY 1984.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #11316F
DOD Mission Area: #333 - Strategic Communications

Title: SAC Communications
Budget Activity: #3 - Strategic Programs

B. (U) Project # 2869, AACE Upgrade Program.

The Aircraft Alerting Communications Electromagnetic Pulse (EMP) (AACE) program will provide EMP-survivable equipment and facilities to relay Positive Control Launch (PCL) messages and Emergency Action Messages (EAM) from SAC bomb wing Command posts to the bomber crews located in the alert facility or in the aircraft on the runway or airborne. The Improved High Altitude Radiation Detection System (IHARDS) will positively identify a nuclear-caused electromagnetic pulse. The shelters and associated consoles will permit command posts to receive the EAM or PCL message by several means and, then, relay the message via EMP-protected radios or telephones located in the AACE shelters. Preliminary analysis was begun in FY 1982. A "First Article" will be developed and tested in FY 1984. Subsequent procurement will provide a total of 25 sets of AACE equipments to be located at SAC bases throughout the continental United States.

C. (U) Project # 2969, Emergency Rocket Communications System (ERCS) Replacement.

This project will provide a research and development effort beginning in FY 1986 to upgrade or replace the ERCS.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable.

Budget Activity: Strategic Programs, #3
Program Element: 11316F, Strategic Air Command Digital Network (SACDIN)

Test and Evaluation Data

1. (U) Development Test and Evaluation: During the development phase, individual subsystems were fabricated and assembled into a prototype of SACDIN. This prototype was successfully tested to determine hardness and security characteristics and to insure that the subsystems properly function together. Simulation was used to exercise the prototype during system tests. The Development Test & Evaluation (DT&E) testing period lasted from the fourth quarter, fiscal year 1979 to the second quarter, fiscal year 1982. ITT Defense Communications Division, Nutley, NJ, the prime contractor, conducted the DT&E. Independent evaluation was performed by the Air Force Test and Evaluation Center. Contractor and Strategic Air Command personnel operated and maintained the system.

(U) The prototype consists of the same hardware as production units (keyboards, printers, processors). In addition, the prototype contains hardened equipment for the Intercontinental Ballistic Missile Launch Control Centers that is also the same as the production equipment. After in-plant testing, SACDIN equipment will be installed at Offutt Air Force Base and Vandenberg Air Force Base and DT&E will be conducted using the actual external interfaces. All DT&E will be completed prior to the production decision. Acceptance testing and checkout will be conducted during production and deployment.

2. (U) Operational Test and Evaluation: The Air Force Test and Evaluation Center (AFTEC) will conduct initial operational test and evalution (IOT&E) of SACDIN equipment installed at Strategic Air Command (SAC) operational locations (Offutt AFB and Vandenberg AFB), the contractor facilities in New Jersey, the contractor's computer program development facility at Gaithersburg, Maryland, and the Air Force Communications Computer Programming Center (AFCCPC). There will be a two-phase IOT&E. Phase I will be from August to October 1983 and involve a limited number of external interfaces. Phase II will be during January 1984 and will include all external interfaces. To evaluate SACDIN operational effectiveness and suitability, the AFTEC test team will use the test network to run exercises simulating SAC operational communications. IOT&E objectives will include system performance, system control, interoperability, human interface, safety, electromagnetic compatibility, and security to the extent allowed by the prototype configuration. The test team will consist of people from AFTEC, SAC, Air Force Communications Command (AFCC), AFCCPC, Air Force Logistics Command (AFLC), Electronic Security Command (ESC), and the National Security Agency (NSA). In addition to conducting separate IOT&E, the test team will participate in and observe selected portions of the contrctor's development test and evaluation (DT&E) efforts from April 1982 to December 1983. Data gathered during the DT&E tests will also be used to meet IOT&E objectives as appropriate. Air Force Systems Acquisition Review Council (AFSARC) III is planned for March 1984.

Budget Activity: Strategic Programs, #3
Program Element: 11316F, Strategic Air Command Digital Network (SACDIN)

3. (U) Systems Characteristics:

Characteristic	Threshold	Demonstrated
Mean Time Between Maintenance (MTBM)		
Missile Base Communications Processor (MBCP)	1125 hours	600 hours * 1875 hours **
Hardened User Terminal Equipment (HUTE)	2250 hours	1025 hours * 3940 hours **
Undetected Character Error Rate	10^{-8}	***
Response Time	15 seconds	13.82 seconds ***
Confidence Level for Delivery of Emergency Action Message (EAM)	99.73%	***
System Functional Availability	99.5%	99.9794% ** 99.8820% *

* From Reliability Growth Program (improving with time)

** Analysis (per ITT availability analysis A058 report)

*** Per A068 2 April 1979, p 2A-42, table A-19A&B. This is the only official document which addresses these characteristics. However, this data is obsolete nd will be reanalyzed during Phase IIB testing.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #12310F
DOD Mission Area: Strategic Information Systems, #334
Title: WWMCCS ADP - NORAD/ADCOM
Budget Activity: Strategic Programs, #3

1. (U) RESOURCES (PROJECT LISTING)($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	1291	6232	31,257*	24,246	Continuing	N/A

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The World Wide Military Command and Control System Automatic Data Processing (WWMCCS ADP) - NORAD/ADCOM program initiates actions to upgrade the Communications System Segment (CSS) of CINCNORAD's 427M Command and Control system. [

* Due to an administrative error, $15,108 of this $31,257 is reflected in the budget details under Program Element 12436F (Command Center Processing and Display System.) See Descriptive Summary - PE 12436F.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	2391	6233	9,956		TBD	TBD
Procurement (Other)			698		1,886	2,600

FY 83 Descriptive Summary estimate was based on preliminary costing data contained in ADCOM Projected Automation Requirement (PAR) 80-3-2 and 80-3-3. These PARs addressed the requirement to replace the computer mainframe(s) performing the CSS function. Revised costing is based on an independent cost estimate (ICE), completed 20 June 1982, that addressed this newly defined requirement.

4. (U) OTHER APPROPRIATION FUNDS ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Procurement (other)	4102	363	3,076	18,459	31,304	52,839

5. (U) RELATED ACTIVITIES: As the communications hub for the NORAD Cheyenne Mountain Complex, the CSS interfaces with virtually all surveillance and/or warning systems. These interfaces are, however, clearly defined and should result in no adverse impact on the CSS nor interfacing systems.

Program Element: #12310F

DOD Mission Area: Strategic Information Systems, #334

Title: WWMCCS ADP - NORAD/ADCOM

Budget Activity: Strategic Programs #3

6. (U) WORK PERFORMED BY: Air Force Systems Command's Electronics Systems Division (ESD) will provide overall program management. Contractors have not yet been identified.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 84: N/A

8. (U) PROJECTS OVER $10 MILLION IN FY 84:

(U) PROGRAM TITLE: Communication System Segment Replacement (CSSR) (Single project in program element)

A. DESCRIPTION: The Communications System Segment (CSS) provides communications for the NORAD Cheyenne Mountain Complex (NCMC) and integrates the individual components into a cohesive system. The CSS provides essential support for the tactical warning and attack assessment mission and the space defense mission by handling complete message processing, formatting, line code conversion and the routing of internal and external user messages. The CSS interfaces with all external facilities serving or served by the NCMC. [

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE

EFFORTS:

(1) (U) FY 1982 Accomplishments: Development of System Operation Concept, System Specification and Request for Proposal (RFP) ıd Statement of Work (SOW) generation.

(2) (U) FY 1983 Program: Competitive concept definition contracts will be negotiated to develop a design concept for a CSSR. Design solution will include state-of-the-art hardware and software and will consider provisions to encourage modularity of both hardware and software, provide automatic fault recovery or fail-soft operation and provide techniques to enhance error isolation and more readily permit changes and improvements to the computer data base and program.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The winning contractor of the competitive concept definition effort will be awarded the contract for the design and development of their proposed system. Delivery of the off-site test facility (OSTF) hardware will be completed in FY 1984. Software design, coding, and testing for the operational system will be initiated. The cost profile for the FY 84 effort was the result of an independent cost study (ICS) completed in June 1982. The ICS was a coordinated effort between NORAD and Air force Systems Command.

Program Element: #12310F
DOD Mission Area: Strategic Information Systems, #133

Title: WWMCCS ADP - NORAD/ADCOM
Budget Activity: Strategic Programs #3

(4) (U) Program to Completion: The CSSR effort will follow an evolutionary acquisition approach. The system will be procured in three blocks (A-C). As each block is developed and tested, it will be turned over to the user. This will provide the user with measurable improvements in operational capability over the six year acquistion cycle. The System Full Operational Capability (FOC) is forecast for FY 1989.

C. (U) MAJOR MILESTONES:	DATE
(1) ADCOM Statement of Need (SON) 1-81	May 81
(2) Concept Definition Contract	Apr 83
(3) Development Contract	Apr 84
(4) Critical Design Review (CDR) (Block A)	Jan 85
(5) Initial Operational Capability (Block A)	Oct 86

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #12311F

Title: NORAD Combat Operations Center/Space Defense Operations Center

DOD Mission Area: Strategic Information Systems, #334

Budget Activity: Strategic Programs, #3

1. (U) RESOURCES (PROJECT LISTING)($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	23,511	24,378	49,464	37,441	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports development of the Space Defense Command and Control System (SPADCCS) consisting of a Space Defense Operations Center (SPADOC) for control of all United States' space defense activities and space surveillance systems, the Prototype Mission Operations Center (PMOC) for antisatellite test activities, the Mission Control Center (MCC) for antisatellite operations, the SPADOC Computations Center (SCC) for astrodynamical computations, and the associated communications networks. The SPADCCS is required to satisfy Presidential and Secretary of Defense directives to improve, in a balanced manner, the space defense capabilities of the United States. This program will develop the SPADCCS in a phased approach to support the evolving space defense capabilities of the United States.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY ($ in thousands)

RDT&E	23,511	25,585	35,688	N/A	Continuing	Not Applicable
Procurement (Other)	4,247	28,005				22,100
Operations and Maintenance	1,400	2,500	2,800		Continuing	Not Applicable

The scope and thrust of the Space Defense Operations Center effort was entirely revised during the FY 1984 Program Objective Memorandum (POM) cycle. The Space Computational Center (SCC) scheduled for replacement during the same time period as the SPADOC acquisition was integrated into this effort. The basis for this decision was an independent cost study, concluded 15 June 1981, that showed a cost avoidance of $120M using the combined approach. Funding changes in RDT&E, Other Procurement, and Operations and Maintenance reflect this change in approach.

4. (U) OTHER APPROPRIATIONS FUNDS ($ in thousands)

Procurement (Other)	2,482	28,005	26,896	26,988	Continuing	Not Applicable
Operations and Maintenance	1,358	2,000	3,700	3,800	Continuing	Not Applicable
Military Construction			1,700			

Program Element: #12311F

DoD Mission Area: Strategic Information Systems, #334

Title: NORAD Combat Operations Center/ Space Defense Operations Center

Budget Activity: Strategic Programs, #3

5. (U) RELATED ACTIVITIES: This program is part of the Space Defense Systems Program involving four functional areas: space survivability, space surveillance, antisatellite, and command and control. Those program elements (PEs) that are directly related are the following: PE 63428F, Space Surveillance Technology; PE 12424F, SPACETRACK; PE 63438F, Satellite System Survivability; and PE 64406F, Space Defense System. Also, the Consolidated Space Operations Center, PE 35130F, will obtain from the Space Defense Operations Center survivability and warning information.

6. (U) WORK PERFORMED BY: Air Force System Command's Space Division in Los Angeles, CA, is responsible for overall management of the Space Defense Command and Control System development. The Prototype Mission Operations Center is being developed by Boeing, Seattle, WA. The concept definition contracts for the Space Defense Operations Center were awarded to Martin Marietta Corporation, Denver, CO and Ford Aerospace Communications Corporation, Colorado Springs, CO. The follow-on development contract for SPADOC will be awarded in March 1983. The primary support contractors are Science Application Incorporated, La Jolla, CA; Aerospace Corporation, Los Angeles, CA, and MITRE Corporation, Boston, MA.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. (U) NORAD COMBAT OPERATIONS CENTER/SPACE DEFENSE OPERATIONS CENTER (SINGLE PROJECT OVER $10 MILLION IN FY 1984):

A. PROGRAM DESCRIPTION: The SPADOC development will provide an integrated command and control capability for space systems. [ ] To remedy this shortfall, the Air Force is aggressively improving and developing space defense capabilities, including: Space Surveillance Systems Satellite Survivability Systems, and Antisatellite Systems. For these elements to be operationally employed in an integrated and coordinated manner, an effective command and control system is essential. [ ] During both peace and conflict, US military operations will require assessment of the situation in space, its impact on terrestrial forces and the ability of the National Command Authorities to respond rapidly to changes in that situation. Responses to a changing situation might include: [ ] The selection of which of these responses is appropriate is dependent on a fully integrated command and control system, usable in both peacetime and under stressed condition. Effective command and control is the key to meeting any potential threat in space.

B. PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) FY 1982 Accomplishments: During FY 1982, the Space Defense Operations Center Phase IV acquisition was initiated. Source selection was completed and the design concept contract awarded in December 1981. Detailed design efforts address software modification requirements, displays, interfaces with existing systems, external/internal communications and long-lead hardware items. [ ] Additionally, in 1982, the Prototype Mission Operations Center hardware was installed in the Cheyenne Mountain Complex and software development and testing continued.

Program Element: #12311F

DoD Mission Area: Strategic Information Systems, #334

Title: NORAD Combat Operations Center/Space Defense Operations Center

Budget Activity: Strategic Programs, #3

(2) FY 1983 Program: [ ] The Space Defense Operations Center Phase IV development contract will be awarded. The detailed design will be firmed and early subsystem and component building and test will be performed. [ ]

(3) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: [ ] The Space Defense Operations Center development and deployment will continue. The initial suite of SPADOC computational hardware and associated peripherals will be delivered to and installed in the NORAD Cheyenne Mountain complex (NCMC). Newly developed system software will be tested and integrated into the SPADOC IV system.

The cost estimate is based on an independent cost study (ICS) concluded in June 1981. Involving personnel from both the NORAD and Air Force Systems Command, the ICS reflected the catalog prices of a candidate commercial-off-the-shelf hardware architecture. The software costs were based on a lines of code estimate provided by NORAD that was run through a commercially accepted cost model. The support costs associated with the program were based on parametric data collected from similar programs.

(4) Program to Completion: [ ] The Space Defense Operations Center development and employment efforts will continue. The initial operational capability of Phase IV Space Defense Center is planned to be achieved during FY 1985. The Space Defense Operations Center is a continuing program.

C. (U) MILESTONES:

	MILESTONES	DATE
(1)	ADC SON 3-79 Validated	Dec 1980
(2)	ASAT MENS Approved	Apr 1981
(3)	SPADOC IV Concept Definition Contract	Dec 1981
(4)	SPADOC IV A Contract Award	Mar 1983
(5)	SPADOC IV A Critical Design Review	Nov 1983
(6)	SPADOC IV B Contract Award	Dec 1983
(7)	SPADOC IV B Critical Design Review	Nov 1984
(8)	SPADOC IV C Contract Award	Mar 1985
(9)	SPADOC IV A Initial Operational Capability	Jun 1985
(10)	SPADOC IV C Critical Design Review	Mar 1986
(11)	SPADOC IC B Initial Operational Capability	Jul 1986
(12)	SPADOC IV C Initial Operational Capability	Mar 1988
(13)	SPADOC IV Fully Operational Capability	Sep 1988

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #12313F
DOD Mission Area: Strategic Surveillance and Warning, #332

Title: Ballistic Missile Tactical Warning/Attack Assessment Support
Budget Activity: Strategic Programs, #3

1. (U) RESOURCES (PROJECT LISTING)($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	1,283	1,893	2,192	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides funds for Tactical Warning/Attack Assessment (TW/AA) system engineering design and analysis, to include the technical configuration, interface standards, functional capabilities, operational concepts, and system implementation plan(s). It will provide the management framework through which the Air Force will apply coordinated oversight for acquisition and interface of missile warning systems. Integration of the warning systems will be ensured by development of standards/techniques for sensor, communications and computer hardware and software. Management of the TW/AA assets as an integrated system is necessary to ensure accurate, timely, and unambiguous warning and assessment information to support force survivability actions and national decision making.

3. (U) COMPARISON WITH FY 1982 DESCRIPTIVE SUMMARY ($ in thousands)

0	1,283	1,658	N/A	Continuing	N/A

4. (U) OTHER APPROPRIATION FUNDS ($ in thousands) N/A

5. (U) RELATED ACTIVITIES: The funds in this program element are provided to insure the integration and coordination efforts of missile warning sensor, communications systems and command center acquisitions. This program is directly related to all projects supporting the Air Force's strategic warning mission.

6. (U) WORK PERFORMED BY: Air Force Systems Command's Electronic System Division (ESD) in Bedford, MA, is responsible for overall management of this effort. ESD coordinates directly with Space Command's System Integration Office (SIO) to insure that the user's requirements are being met and that no duplicative projects are undertaken. The funds in this program are to pay for Mitre support. Mitre Corporation is a federal contract research center (FCRC) headquartered in Bedford, MA. System Engineering/Technical Assistance (SETA) contracts, on a task order basis, may be obtained on an "as needed" basis.

7. (U) BALLISTIC MISSILE TACTICAL WARNING/ATTACK ASSESSMENT (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984): This effort was established as a new start in FY 1983. The initial projects scheduled for completion during this first year include development of the System Operations Concept (SOC), System Hardware and Software acquisition specifications, request for proposal (RFP) and Statement of Work (SOW) for the Command Center Processing and Display System (CCPDS) replacement program (PE 12436F). This replacement program, validated in Strategic Air Command (SAC) Statment of Need

Program Element: #12313F
DOD Mission Area: Strategic Surveillance and Warning, #332

Title: Ballistic Missile Tactical Warning/Attack Assessment Support
Budget Activity: Strategic Programs, #3

(SON) 1-80 is scheduled to commence in FY 1984. In addition to the acquisition/development documentation addressed above, a comprehensive independent cost study will be conducted during FY 1983 to validate the programmed funds for the replacement effort. During FY 1984, engineering efforts will be directed toward contributions and integration of new or improved sensors and/or communications sub-systems. Specific emphasis will be placed on integration of the Southeast and Southwest PAVE PAWS systems, as well as the Ballistic Missile Early Warning System (BMEWS) upgrade. Additionally, initial engineering design efforts will commence for a survivable warning information communications technique. Preliminary analysis of the European warning requirements to support a worldwide Tactical Warning/Attack Assessment (TW/AA) mission for crisis and force management will also be initiated.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable

9. (U) MILESTONES:

	MILESTONES	DATE
A.	System Operations Concept Development	Mar 83
B.	System Specifications Development	May 83
C.	Independent Cost Study Completion	Jul 83
D.	Request for Proposal Development	Sep 83
E.	Statement of Work Development	Sep 83

FY 1984 RDT&E DESCRIPTIVE SUMMARY

PROGRAM ELEMENT (PE): # 12325F TITLE: JOINT SURVEILLANCE SYSTEM (JSS)
DoD MISSION AREA: STRATEGIC AIR DEFENSE, #122 BUDGET ACTIVITY: STRATEGIC PROGRAMS, #3

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

PROJECT NUMBER	TITLE	FY 1982 ACTUAL	FY 1983 ESTIMATE	FY 1984 ESTIMATE	FY 1985 ESTIMATE	ADDITIONAL TO COMPLETION	TOTAL ESTIMATED COST
TOTAL FOR PROGRAM ELEMENT		1,395	1,187	769	750	0	47,050
968H	JSS	1,395	1,187	769	750	0	47,050

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Joint Surveillance System (JSS) provides command and control of air defense forces for peacetime air surveillance and airspace sovereignty to replace the existing Semi-Automatic Ground Environment (SAGE), Back-up Interceptor Control (BUIC), and manual air defense systems. The objective of this program is large cost avoidance in radar operation and operation center support through the elimination of redundancy in the civilian and military radar nets, and replacement of the SAGE/BUIC systems which are expensive to maintain and operate. The system will use radar data from a single net of Federal Aviation Administration (FAA) and military radars in the Continental United States (CONUS), Alaska and Hawaii to input to FAA Air Route Traffic Control Centers and Air Force Region Operations Control Centers (ROCCs). Two ROCCs are being procured for Canada via foreign military sales.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY ($ in thousands):

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
RDT&E	1,295	1,187	0	0		45,541
Other Procurement	3,143	2,580	1,982	2,150		135,980 (5)
Military Construction						37,800

FY 82 RDT&E was increased by 100K for a joint USAF/Department of Treasury test of an aerostat-borne radar system. FY 84 and 85 RDT&E was increased by 769K and 750K, respectively, for extending Program Office support for Congressionally directed Hawaii ROCC (HIROCC) Program. FY 82 Other Procurement was increased by 13024K. This was a reprogramming action for procurement of the replacement SEEK SKYHOOK aerostat-borne radar at Cudjoe Key AFS, FL and installation of an aerostat-borne radar system at Cape Canaveral AFS, FL. FY 84 and FY 85 Other Procurement was increased for HIROCC system integration and acceptance testing. Remaining differences in FY 83, 84, and 85 Other Procurement are due to adjustments in initial spares.

4. (U) OTHER APPROPRIATION FUNDS ($ in thousands):

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
Other Procurement	15,167	10,525	3,689	2,381	270	151,217
(Quantity ROCC)						(6)
Military Construction						37,800

FY 1984 RDT&E DESCRIPTIVE SUMMARY

PROGRAM ELEMENT (PE): #12325F
DoD MISSION AREA: STRATEGIC AIR DEFENSE, #122

TITLE: JOINT SURVEILLANCE SYSTEM (JSS)
BUDGET ACTIVITY: STRATEGIC PROGRAMS, #3

5. (U) RELATED ACTIVITIES: JSS is related to the Semi-Automatic Ground Environment Back-up/Interceptor Control (SAGE/BUIC) systems which it will replace. JSS is also related to the CONUS Over-the-Horizon Backscatter (OTH-B) Radar (PE 12417F), Surveillance Radar Stations (PE 12411F), DEW Radar Stations (PE 12412F), and the E-3A programs. The SAGE/BUIC System is phased out only after JSS becomes operational. JSS Region Operations Control Centers (ROCCs) interface with CONUS OTH-B and DEW Line for data from these systems. The JSS system includes Alaskan Air Command surveillance radars modernized by SEEK IGLOO (Project 2433, PE 12411F). JSS ROCCs must interface with the E-3A for data and in order to effectively transition command and control. JSS will provide command and control of air defense forces as the tactical situation dictates. The E-3A, as the more survivable element of air defense, will provide command and control during crisis and wartime. Coordination on all major activities is obtained from Air Force Communications Command, Tactical Air Command, Air Force Logistics Command, Alaskan Air Command, Pacific Air Forces, North American Aerospace Defense Command, and the Air Force Systems Command. Coordination is also obtained from FAA on radar sensor portions of the program. Close coordination is maintained with Canada by having Canadian officers assigned to the JSS Program Office.

6. (U) WORK PERFORMED BY: Program management is provided by the Electronics System Division of the Air Force Systems Command. The prime contractor is Hughes Aircraft Corporation, Fullerton, CA. Engineering support is provided by Input/Output Computer Sciences, Waltham, MA; Logicon Incorporated, Lexington, MA; MITRE Corporation, Bedford, MA; and Support Systems Associates Inc., Burlington, MA.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

PROJECT: 968H Joint Surveillance System. Accepted the System Hardware Support Facility (SHSF) at Tyndall AFB, FL, in Dec 1981. The SHSF was turned over to Tactical Air Command (TAC) in Jan 1982. Five CONUS sensor sites and nine of the 14 sensor sites in Alaska achieved initial operational capability (IOC) in the JSS configuration in FY 1982. Acquisition of HIROCC commenced in FY 1982. Sensor Integration and IOC will be completed in FY 1983. The ROCC Software Support Facility and the Southeast ROCC, at Tyndall AFB, FL, the first US ROCC, were accepted by the USAF in FY 1983. Current plans are to accept remaining ROCCs except HIROCC during this year. Software efforts, integration, and test will receive priority attention leading to IOC of all ROCCs, but HIROCC, in 1983. HIROCC will achieve IOC in June 1984. JSS will plan to go to full operational capability (FOC), except for HIROCC, on 1 Dec 1983. Completion of the JSS program is planned to occur in FY 85.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #12411F
DOD Mission Area: Strategic Air Defense, #122

Title: Surveillance Radar Stations/Sites
Budget Activity: Strategic Programs, #3

1. (U) RESOURCES (PROJECT LISTING) ($ in Thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	6,134	1,147	5,756	3,620	Continuing	To Be Determined
2433	SEEK IGLOO	6,134	1,147	1,087	1,044	0	39,320
2980	North Atlantic Defense System	N/A	N/A	4,669	2,576	Continuing	To Be Determined

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element funds strategic air defense improvements. The RDT&E project, SEEK IGLOO, will enhance the surveillance and air space control capability of Alaskan Air Command (AAC) and reduce support costs through modernization of existing AAC surveillance radars. SEEK IGLOO will develop a minimally attended radar, using current technology, to replace the existing separate surveillance and height finder radars. The new radar will have integral height finding capability, improved performance in the presence of clutter and will be maintained by significantly fewer personnel than are required in existing systems. The North Atlantic Defense System (NADS) project funds improvements to command, control, and communications (C^3) and surveillance equipment in the North Atlantic [ ] required to correct air defense deficiencies and provide for defense of critical [ ] This area is considered a linchpin of the Northern flank and the key to reinforcement of the entire NATO theatre.

3. COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY ($ in Thousands):

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	4,284	1,147	1,123	1,100	0	38,043
Procurement (Other) *	57,854	37,264	8,592	0	0	103,710

*Includes initial spares

The RDT&E increase in FY 1982 funded planning for the SEEK IGLOO project related to deployment of additional minimally attended radars for surveillance improvements. The RDT&E increase in FY 84 and 85 is for NADS. NADS is a new project for 1984. NADS RDT&E funds will provide for system definition, equipment assessment, and software development for required C^3 and surveillance improvements. Increased Other Procurement in FY 84 will procure one additional minimally attended radar and initial spares to replace separate surveillance and height finder radars at North Truro AFS, MA. Increases in Other Procurement funds in FY 1985 will buy additional SEEK IGLOO initial spares and will initiate procurement of NADS equipment. Additional military construction funds beginning in FY 1985 support future surveillance capability for defense of [ ]

Program Element: #12411F
DOD Mission Area: Strategic Air Defense, #122

Title: Surveillance Radar Stations/Sites
Budget Activity: Strategic Programs, #3

4. (U) OTHER APPROPRIATION FUNDS ($ in Thousands):

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Other Procurement						
Funds	57,735	36,935	20,664	27,737	Continuing	To Be Determined
Quantities (SEEK IGLOO)	(9)	(4)				
Military Construction Funds	40,250	43,600	0	28,500	Continuing	To Be Determined

5. RELATED ACTIVITIES: The study of SEEK IGLOO alternatives and definition of technical requirements were performed under Program Element (PE) 12325F, Joint Surveillance System (JSS). The new radar was designed to interface with the JSS equipment. One SEEK IGLOO radar has been diverted to satisfy an urgent requirement to replace an aged radar in Berlin, Germany. Reimbursement to replace the Alaskan asset will be provided by the Federal Republic of Germany. The SEEK IGLOO minimally attended radar (MAR) will be used to enhance performance and logistics supportability of the Distant Early Warning (DEW) Line. Implementation of DEW Line improvements will be accomplished under PE 12412F, DEW Radar Station, Project 2710, titled NORTH WARNING. SEEK IGLOO MARs may also be used to modernize the JSS and to improve surveillance capabilities of the North Atlantic Defense System (NADS). NADS is currently jointly funded by the Navy and Air Force, with NATO participation a future possibility. The Navy and Air Force will fund surveillance upgrades for [ ]

6. (U) WORK PERFORMED BY: Efforts are managed by the Electronics Systems Division, Hanscom AFB, MA. Support is provided by MITRE Corporation, Burlington, MA; Rome Air Development Center, Griffiss AFB, NY; and the Electromagnetic Compatibility Analysis Center, Annapolis, MD. SEEK IGLOO design competition contracts were awarded to: General Electric Company, Syracuse, NY; ITT Gilfillan, Inc., Van Nuys, CA; and Westinghouse Electric Corp., Baltimore, MD. After evaluation of design proposals, a contract option to fabricate and test two preproduction prototypes was exercised in July 1979 with General Electric Co.

7. PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) 2433 SEEK IGLOO: The purpose of SEEK IGLOO is to modernize the long-range surveillance and air space control capability of the Alaskan Air Command (AAC) and reduce operations and support costs. Existing radars have inadequate performance in the Alaskan radar clutter environment and are expensive to operate and support due to age. Radar station facilities were deployed in the 1950s with a 10 year design life. The project modernizes facilities and develops a MAR to improve radar performance and lower operations and support costs. Initial Operational Test and Evaluation of the MAR was successfully completed at King Salmon Air Force Station, AK in September 1982. A military construction contract was awarded in August 1982 to consolidate, replace and upgrade site support facilities at four remote radar stations. Production of twelve MARs and refurbishment of the King Salmon prototype will be initiated in FY 1983. The King Salmon radar is planned to be operational in May 1983. Award of a second military construction contract in FY 1983 will complete modernization of facilities at remaining sites. Program Office engineering and management will continue to support radar production and installation with a planned completion date of February 1985.

Program Element: #12411F
DOD Mission Area: Strategic Air Defense, #122

Title: Surveillance Radar Stations/Sites
Budget Activity: Strategic Programs, #3

B. 2980 NORTH ATLANTIC DEFENSE SYSTEM: The purpose of the North Atlantic Defense System (NADS) program is to correct serious air defense deficiences in [ ] and provide for surveillance of critical [ ] Existing command, control, and communication (C^3) and surveillance equipment will be ineffective if challenged in wartime. The current [ ] Air Defense and Early Warning System is manually operated, antiquated and deficient in radar coverage. The lack of automation and inadequate C^3 facilities precludes timely distribution and exchange of vital air defense information received from radar sites, airborne early warning systems, maritime forces, and adjacent NATO air defense ground environment systems. Existing air defense ground environment systems do not provide surveillance of critical [ ] With existing deficiencies, Soviet aircraft and surface and subsurface vessels can exploit the poor C^3 capability and the [ ] to attack critical targets in [ ] without warning and gain control of North Atlantic [ ] [ ] is crucial to North Atlantic [ ] protection, Soviet containment, and the reinforcement and defense of Europe. Overall Atlantic strategy hinges on use of [ ] as the key operating base to monitor Soviet access to the Atlantic and support wartime operations in the North Atlantic and Norwegian Sea. In FY 84 this project will support system definition, equipment assessment, and software development to correct C^3 deficiencies and lead to FY 85 equipment procurement.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element (PE): #12412F Title: Distant Early Warning (DEW) Radar Stations
DoD Mission Area: Strategic Surveillance and Warning, #332 Budget Activity: Strategic Programs, #3

1. (U) RESOURCES (PROJECT LISTING): ($ in Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	8,000	31,282	29,288	13,795	82,365
2710	NORTH WARNING	0	8,000	31,282	29,288	13,795	82,365

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This PE supports the operation of 31 existing DEW Line radar stations and funds the NORTH WARNING DEW Line improvement program. The DEW Line is required to provide tactical warning of a bomber or cruise missile attack against the North American Continent through a line extending from Alaska to Greenland. The warning provides the National Command Authorities with time for decision making and survival actions, permits the launch of strategic retaliatory and command and control aircraft for survival and alerts air defense fighters to intercept attacking aircraft. The present DEW Line [ ] Because of its age, the existing system is increasingly difficult and costly to operate and maintain. The program objective is to [ ] reducing operations and maintenance costs. The improved DEW Line will be capable of [ ] NORTH WARNING investment funds will be amortized three years after program completion by reductions in operations and support costs attributable to NORTH WARNING and phase down of US contributions to the operation of the CADIN-Pinetree.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in Thousands)

	FY 1983	FY 1984	Additional to Completion	Total
RDT&E	7,995	38,468	44,800	91,300
Procurement (Other)	31,244	51,865	344,700	427,800

The RDT&E decrease reflected in FY 1984 and in the RDT&E total increases schedule risk for development of the unattended short range radar. Other Procurement funds in FY 1983 were reduced to zero to reflect Authorization Conference denial of funds for four (4) AN/FPS-117 radars. The procurement increase in FY 1984 adds back funds to procure radars and initial spares.

4. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Procurement (Other)*			92,594	156,138	169,203	417,935*
(Quantity AN/FPS-117)			(11)	(2)	(0)	(9)
(Quantity Short Range Radar)			(0)	(18)	(15)	(33)
Military Construction			20,530	42,789	46,375	109,694

*Includes initial spares

Program Element: #12412F — Title: DEW Radar Stations
DoD Mission Area: Strategic Surveillance and Warning, #332 — Budget Activity: Strategic Programs, #3

5. (U) RELATED ACTIVITIES: Design study contracts for the unattended radar (part of the Unattended/Minimally Attended Radar Study) and total unattended site were funded in PE 63101F (Preliminary Design and Development). The AN/FPS-117 minimally attended radar developed under PE 12411F (Surveillance Radar Stations/Sites, Project SEEK IGLOO) is planned for use in the DEW Line improvement program. Study effort and procurement planning related to application of the AN/FPS-117 for DEW Line improvement was performed under PE 12411F. Radar coverage around North America will be contiguous with northern coverage provided by an improved DEW Line and the remaining CONUS coverage provided by Over-the-Horizon (OTH-B) radars in PE 12417F. Surveillance data from the improved DEW Line will be transmitted to Northern Region Operation Control Centers developed under PE 12325F, Joint Surveillance System. The DEW Line improvement program is a key element of air defense upgrades detailed in the DoD North American Air Defense Master Plan and identified as part of President Reagan's Strategic Modernization Plan. The DEW Line is an integral part of North American Aerospace Defense Command (NORAD) and operation of the system is supported by a US-Canadian Government-to-Government Agreement.

6. (U) WORK PERFORMED BY: This effort is managed by the Electronic Systems Division, Hanscom AFB, MA. MITRE Corporation, Burlington, MA; Rome Air Development Center, Griffiss AFB, NY; and the Electromagnetic Compatibility Analysis Center, Annapolis, MD, are supporting the effort. AN/FPS-117 long range radars will be procured from General Electric Company, Syracuse, NY, and provided as Government Furnished Equipment to a competitively selected systems contractor responsible for overall system design, integration and construction.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) PROJECT: 2710 NORTH WARNING.

A. PROJECT DESCRIPTION: NORTH WARNING will improve the operational capability of the DEW Line by [ ] reducing operations and support costs by approximately half. Present Soviet bombers can fly [ ] The improved DEW Line will be capable of detecting improved threat bombers such as BLACKJACK [ ] A NORTH WARNING pre-planned product improvement will provide additional capability, if needed, [ ] The project will procure thirteen (13) AN/FPS-117 long range radars and approximately thirty-seven (37) short range unattended radars for deployment. NORTH WARNING must develop, fabricate and test the short range unattended radars and upgrade communications and construct facilities as part of the improvement program.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) (U) FY 1982 Accomplishments: Not Applicable

(2) FY 1983 Program: A contract will be competitively awarded for overall DEW Line systems design and integration, communications design and short range radar station design, fabrication and test. The planned effort has been delayed due to Congression deferral of funds, without prejudice. However, due to the critical need to [ ] northern approaches to North America, a DoD reprogramming request seeks to initiate the program in FY 1983.

Program Element: #12412F

DoD Mission Area: Strategic Surveillance and Warning, #332

Title: DEW Radar Stations

Budget Activity: Strategic Programs, #3

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Based on an overall systems contract award in FY 83, fabrication of four short range radars will begin. The systems contractor will complete design of the communications subsystem and begin turnkey construction of the first of five new AN/FPS-117 radar sites. Eleven (11) long range AN/FPS-117 radars will be procured and provided as Government Furnished Equipment to the selected systems contractor Cost estimates for the AN/FPS-117 are based on government experience from the SEEK IGLOO development and production contract. Military construction estimates are based on construction of similar AN/FPS-117 facilities in Alaska. Initial RDT&E estimates were developed using parametric cost estimates and are updated annually based on recent contractual experience.

(4) Program to Completion: Production of short range radars is planned to start in FY 1985. Installation of radars will be accomplished in two phases. The first phase, with a planned completion date of [ ] will improve the existing capability by integrating radar surveillance data from modern AN/FPS-117 long range radars, four prototype short range radars and 17 existing AN/FPS-19 radars and communications to enable processing of surveillance data within Region Operations Control Centers. The second phase, to be complete in [ ] would retire existing obsolete AN/FPS-19 radars and install 33 short range unattended radars to provide northern all altitude surveillance and improved radar performance.

C. (U) MAJOR MILESTONES: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #12417F
DoD Mission Area: Strategic Surveillance and Warning, #332

Title: CONUS Over-the-Horizon Radar System
Budget Activity: Strategic Programs, #3

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimate Costs
	TOTAL FOR PROGRAM ELEMENT	16,735	77,070	99,130	47,162	Continuing	To be determined

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for the development of an Over-the-Horizon Backscatter (OTH-B) radar to improve our present limited capabilities for providing tactical early warning against attack on North America by bombers and air-to-surface missiles. Development of an OTH-B radar to provide long-range wide area surveillance at all altitudes would: provide coverage of the coastal approaches from approximately 500 nautical miles out to 1800 nautical miles; increase warning time for survival of retaliatory forces; provide decision time for National Command Authorities consistent with missile warning requirements; and significantly enhance redeployment options of available defense forces. The planned acquisition is for two 180 degree coverage sites, one on each North American coast. Extension of coverage to the South is a future option.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimate Costs
RDT&E	17,235	79,175	103,991		66,800	267,200
Procurement	0	0	192,105		283,300	475,400

FY 84 RDT&E differences reflect revised inflation indices. Total estimated costs to be determined for the entire East West and future options for South coverage system. FY 83 Descriptive Summary total estimate is for the East-West system only. FY 82 RDT&E change is for no-impact fund shift to another program. FY 83 RDT&E change supports reprogramming for NORTH WARNING (Improved DEW Line).

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 82 Actual	FY 83 Estimate	FY 84 Estimate	FY 85 Estimate	Additional To Completion	Total Estimate Costs
Procurement (Other)	0	0	194,260	264,307	Continuing	To be determined
Military Construction	0	1,200	11,600	18,824	Continuing	To be determined

5. (U) RELATED ACTIVITIES: The CONUS OTH-B radar system is being developed to provide all-altitude tactical early warning in support of our strategic air defense mission. Compatibility with related programs such as the Distant Early Warning Radars (PE 12412F), the Joint Surveillance Systems (PE 12325F), and air defense interceptor forces is planned. The OTH-B system will send track information to the Region Operations Control Centers of the Joint Surveillance System and to the NORAD Cheyenne Mountain Complex. Communications will be provided under OTH Radar Systems Comm (PE 12444F). Related OTH developments by the Office of Naval Research and the Naval Electronic Systems Command in the areas of sea surveillance are monitored by the Air Force.

Program Element: #12417F

DoD Mission Area: Strategic Surveillance and Warning, #332

Title: CONUS Over-the-Horizon Radar System

Budget Activity: Strategic Programs, #3

6. (U) WORK PERFORMED BY: The development of the CONUS Over-the-Horizon Backscatter (OTH-B) radar system and supporting OTH technical efforts are managed by the Air Force Electronics System Division, Hanscom AFB, MA. The radar prime contractor is the General Electric Co., Syracuse, NY. Major subcontractors include Continental Electronics, Dallas, TX, for the transmitter subsystem and TRW, Redondo Beach, CA, for the software development. Continuing OTH technical efforts, analysis, engineering studies and support are provided by: Rome Air Development Center, Griffiss Air Force Base, NY; SRI International, Remote Measurements Laboratory, Menlo Park, CA; Naval Research Laboratory, Washington, D.C.; MITRE Corporation Bedford, MA; and the Air Force Geophysics Laboratory, Hanscom Air Force Base, MA.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 84: Not Applicable.

8. (U) CONUS OVER-THE-HORIZON RADAR SYSTEM (SINGLE PROJECT OVER $10 MILLION IN FY 84):

A. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) (U) FY 82 ACCOMPLISHMENTS: An Air Force Systems Acquisition Review Council (AFSARC) provided a development and deployment decision on East and West Coast operational radar systems and directed planning for a South system. The contract was awarded to upgrade the experimental radar system in Maine to a fully operational 60 degree azimuthal coverage Initial Operating Sector (IOS) of the East Coast Radar System. Work was begun to expand and modify the transmitter and receiver subsystems. Operational system software development for radar system control and target detection, tracking and correlation was initiated and specifications established. Design began on the operations center. The first formal design reviews were completed. Surveys of candidate sites for the West Coast system were completed.

(2) (U) FY 83 PROGRAM: Development will continue on the upgrade to an IOS configuration. Fabrication and procurement of key hardware items began, including the computers and radar data display equipment. System engineering and integration effort started. Design of the full East Coast Radar System was initiated. Hardware and software tests will begin on critical subsystems, which include receiver, transmitter, and signal processing equipment components. Clearing and grading of the IOS transmit and receive sites will take place. Surveys of candidate South coverage system locations are planned. Design of the technical facilities for the transmit and receive sites and the operations center will be completed. Continued technical support efforts are directed at system risk reduction and design to control life cycle costs.

(3) (U) FY 84 PLANNED PROGRAM AND BASIS FOR FY 84 RDT&E REQUEST: The FY 84 funds will be used to continue the final development of the 60 degree coverage IOS and complete the design of the East Coast Radar System (design/integration of remaining 120° coverage). Fabrication and in-plant testing and integration of the IOS transmitter, receiver, and operations center radar control system equipment will be accomplished for the field deployment of the IOS. Operational software will be developed and tested with the new and modified hardware, and a radar operations center will be developed for interface with NORAD and the Northeast Region Operations Control Center of the Joint Surveillance System. Construction of the IOS transmitter, receiver, and operations sites will begin with installation of radar system equipment and modified antenna arrays. Construction includes a technical facility for radar system control and operation. Technical efforts to reduce risk and control life cycle costs will continue. Cost estimates for the IOS and planned East-West coverage system are derived from an Independent Cost Study performed in September 1981 to support the AFSARC review.

Program Element: #12417F
DoD Mission Area: Strategic Surveillance and Warning, #332

Title: CONUS Over-the-Horizon Radar System
Budget Activity: Strategic Programs, #3

(4) PROGRAM TO COMPLETION: Development and field installation of the Initial Operating Sector (IOS) will continue and be completed in FY[ ] Tests on the IOS will continue into FY[ ] Additional 60 degree sectors will be procured to complete the East Coast system. Operational Test and Evaluation (OT&E) of the IOS and the full East Coast Radar System will be complete [ ] A 180 degree coverage system will be procured to provide initial West Coast coverage in [ ] Exercise option for South 120 degree coverage in accordance with the DoD North American Air Defense Master Plan.

B. MAJOR MILESTONES:

			DATE
1.	System Definition Complete		Nov 1973
2.	Prototype Contract Award		Mar 1975
3.	Initiate Program Restructuring		Dec 1976
4.	Conclude Technical Feasibility Test		Feb 1981
5.	Conclude IOT&E		Jun 1981
6.	AFSARC Review		Nov 1981
7.	Development Decision		Jan 1982
8.	Development Contract Award	*(Apr 82)	Jun 1982
9.	Program Review		Apr 1983
10.	Initial Operational Capability (East and West)		[
11.	Full Operational Capability (South)		]

* Date presented in FY 1983 Descriptive Summary

C. (U) EXPLANATION OF MILESTONE CHANGES

(U) Contract award slipped two months because the contractor had to revise his proposal to fully meet development specifications and FY 82 budget limitations.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #12423F Title: Ballistic Missile Early Warning System (BMEWS)
DoD Mission Area: Strategic Surveillance and Warning, #332 Budget Activity: Strategic Programs, #3

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	12,752	10,262	10,807	6,730	Continuing	Not Applicable

2. (U) *BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED:* The Ballistic Missile Early Warning System (BMEWS) is being modernized to better support the national nuclear retaliatory strategy of flexible response. Planned improvements to radars and data processing equipment will increase the system's capability to detect, track and provide accurate and timely warning and assessment of the greatly increased threat posed by modern Soviet missiles equipped with Multiple Independently Targeted Reentry Vehicles (MIRV). In addition, ongoing replacements of the site computers will stop the deteriorating realibility caused by system aging and the nonavailability of spare parts.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY ($ in thousands):

RDT&E	12,752	10,652	9,676		Continuing	Not Applicable
Procurement (Other)	35,349	4,200	0		Continuing	Not Applicable

In FY 84 $1.432M was moved from the Operations and Maintenance appropriations to RDT&E within the PE. This is to fund expected increased testing costs.

4. (U) OTHER APPROPRIATION FUNDS ($ in thousands):

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Procurement (Other)*	35,376	4,200	1,980	2,097	Continuing	Not Applicable
Operation and Maintenance	2,775	3,128	0	0		

5. RELATED ACTIVITIES: BMEWS is part of the national system for Tactical Warning and Attack Assessment. It provides confirmation of initial launch detection information provided by [ ]satellites and complements the information provided by the Sea Launched Ballistic Missile Detection and Warning network and the NORAD Space Detection and Tracking System. BMEWS data is provided to the National Military Command Center, the Strategic Air Command Command Center and other users via the NORAD 427M System and World Wide Military Command and Control System (WWMCCS).

* Includes initial spares

Program Element: #12423F   Title: Ballistic Missile Early Warning System (BMEWS)
DoD Mission Area: Strategic Surveillance and Warning, #332   Budget Activity: Strategic Programs, #3

6. (U) WORK PERFORMED BY: Air Force Systems Command, Electronic Systems Division, Bedford, MA, in conjunction with North American Aerospace Defense Command (NORAD), Aerospace Defense Command, Space Command, Strategic Air Command, and Air Force Communications Command. General system engineering is being provided by the Mitre Corporation of Bedford, MA. The Missile Impact Predictor (MIP) computer replacement is under contract to Federal Electric Corporation of Paramus, NJ, with major subcontracts to Control Data Corporation of Los Angeles, CA, and Science Applications Incorporated of Huntsville, AL. Contracts for a competitive initial system design of the BMEWS radar upgrade modificaitons have been awarded to: Federal Electric Corporation, Paramus, NJ; Raytheon Corporation Wayland, MA; and Norden Systems Division, United Technologies Corporation, Norwalk, CT. A contract for the actual modification work will be awarded to one of these three competitors during 1983.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable.

8. (U) PROJECT OVER $10 MILLION IN FY 1984: (BMEWS Modernization is all one project.)

A. (U) PROJECT DESCRIPTION: The BMEWS modernization project will assure continued reliable operation of our Intercontinental Ballistic Missile (ICBM) warning network by replacing aged and costly to maintain site computers. It will also improve the ability of BMEWS to detect, track and give warning of a modern Soviet missile attack, by modifying key radar systems to allow them to handle the much larger number of smaller objects in a Multiple Independently Targeted Reentry Vehicle (MIRV) attack.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

1. (U) FY 82 ACCOMPLISHMENTS: During FY 82 work continued on the replacement of the Missile Impact Prediction (MIP) computers at all three BMEWS sites. Although this effort has been delayed for contractual reasons, it is now back on course. Software translation and in-plant testing are nearly complete. New computers have been installed at all sites and final testing is about to begin. New scheduled delivery dates for the Clear, AK; Thule, Greenland; and Fylingdales, England sites are April, June and August of 1983. Also, during FY 82 a six month competitive initial system design effort was conducted to determine which of several proposed radar modification alternatives would provide the most cost effective improvement in BMEWS ICBM warning. A contract for the actual modification work will be awarded in FY 83. A byproduct of the design study is a determination that the FY 82 project funds, originally earmarked for improvements to the Fylingdales radars, could be more effectively applied to a more extensive upgrade of the Thule site radars. This is because Thule covers a much larger portion of the threat and should thus get the highest priority.

2. (U) FY 1983 Program: In FY 83 the MIP computer replacement will be completed at all three sites; and a contract will be awarded for upgrade of the radars at the Thule site.

3. (U) FY 1984 Planned Program and Basis for FY 84 Request: In FY 84, work will continue on the radar modifications begun in FY 83. Funds requested in FY 84 will be used for continued development work on radar improvements, test planning, and system engineering support to the project.

Program Element: #12423F   Title: Ballistic Missile Early Warning System (BMEWS)
DoD Mission Area: Strategic Surveillance and Warning, #332   Budget Activity: Strategic Programs, #3

(U) The cost estimates used to develop the FY 84 request are based on the results of the three contractor design and cost trade off competition.

The BMEWS was designed and built in the late 1950s and early 1960s. At the time, a mass missile raid was defined as 20 or more missiles each having only one warhead; and our national nuclear retaliatory strategy was massive retaliation. A major upgrade of the BMEWS radars is needed because twenty years of system aging and a much larger and more complex missile threat now [

]

The BMEWS was originally designed to predict missile impact points by tracking the large, easy to detect, rocket booster and then extrapolating the ballistic path of the single warhead. [

The proposed modification to the radars at the Thule site would reduce the size of the radar range resolution cell by changing the radar bandwidth. This would allow the radar to discriminate and track individual objects which are much closer together [ ] With this improvement in resolution and an appropriate increases in the capacity of site computers, the sites will be able to track a much greater portion of the missile raid and provide considerably more accurate data for assessing the nature of the attack.

4. (U) PROGRAM TO COMPLETION: Modernization of the Thule radars will be completed in FY 87.

C. (U) MILESTONES:

MILESTONES	DATE
ADCOM ROC 2-75	Feb 75
ADCOM ROC 3-75	Oct 75
MIP Computer Replacement Contract Award	Aug 80
Radar Design Phase Contract Award	Apr 82
Radar Modification Contract Award	Mar 83
MIP IOCs Site II	Apr 83
Site I	Jun 83
Site III	Aug 83
Thule Radar IOC	FY 87

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #12424F   Title: SPACETRACK
DoD Mission Area: #332, Strategic Surveillance and Warning   Budget Activity: #3, Strategic Program

1. (U) RESOURCES (PROJECT LISTING): ($ in Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	8,018	5,542	5,659	7,519		
2295	Ground-Based Electro-Optical Deep Space Surveillance System	2,318	1,187	1,842	4,685	Continuing	N/A
2296	Ground-Based Sensors	5,700	4,355	3,817	2,834	Continuing	N/A

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program incorporates near and far term operational systems into SPACETRACK in support of satellite attack warning and verification, rapid alerting for [ ] These research and development efforts will: (1) support the deployment of a five-site global ground-based electro-optical deep space surveillance (GEODSS) system to [ ] out to synchronous altitude and beyond; (2) [ ] through the Pacific corridor with Pacific radars; Defense Advanced Research Projects Agency (DARPA) Long-Range Tracking and Instrumentation Radar (Altair) on Kwajalein, GPS-10 radar in the Philippines and refurbished C-Band radar from USNS Arnold on Saipan; (3) provide rapid and accurate calibration of SPACETRACK radars using the Navy transit satellites; (4) transition the Defense Advanced Research Projects Agency Maui Optical Station (AMOS) Haystack and Kaena Point sites to SPACETRACK for space object identification satellite mission assessment operational uses; (5) and provide extended range capability for selected SPACETRACK radars. Mission need is documented in ADCOM Statement of Need (SON) 3-79, Air Force Mission Element Need Statement (AFMENS) for ASAT capability (validated by Secretary of Defense) and Justification for Major System New Start (JMSNS) for Space Surveillance (validated by Defense Resources Board).

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands).

RDT&E	7,970	5,542	5,146
Procurement (Other)	20,164	3,915	1,742

Explanation of Changes: In FY 84-$.7M in RDT&E and $2.2M in Procurement were added to Project 2295 to modify GEODSS Site 4 software and hardware to operate at southern latitude location (Diego Garcia) vice originally intended northern latitude location (Iran).

Program Element (PE): #12424F
DoD Mission Area: #332, Strategic Surveillance and Warning

Title: Spacetrack
Budget Activity: #3, Strategic Program

4. (U) OTHER APPROPRIATION FUNDS:

Project Number	Title	FY 1982 Annual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
2295	Procurement (Other)*	17,167	2,914	3,040	8,550	Continuing	N/A
	(Quantity)	(1)					
	Military Construction			14,070	23,627	Continuing	N/A
2296	Procurement (Other)*	2,997	1,001	884	7,561	Continuing	N/A
	Military Construction		1,750			Continuing	N/A

* Does not include initial spares. Procurement is for projects with Research and Development activity only.

5. (U) RELATED ACTIVITIES: Spacetrack is part of the singly managed Space Defense Systems Program involving four functional areas: Antisatellite, Space Surveillance, Space System Survivability, and Command and Control. This program is integrated with those programs which comprise the Space Defense Systems Program: PE 63428F, Space Surveillance Technology PE 64406F, Space Defense System; PE 12450F, Space Defense Operations; PE 63438F, Satellite Systems Surivability; and PE 12311F, NORAD American Air Defense Combat Operations Center. The baseline and technology for the GEODSS system and the SPACETRACK improved radar calibration, extended range and radar imaging upgrades were developed and demonstrated under PE 63428F. SPACETRACK will support the acquisition and deployment of the survivable space-based space surveillance (SBSS) system being developed under PE 63428F.

6. (U) WORK PERFORMED BY: Program management is provided by Headquarters, Space Division, Los Angeles AFS, CA, and Headquarters, Electronic Systems Division, Hanscom AFB, MA. TRW, Newbury Park, CA, is the prime contractor for GEODSS. GEODSS subcontractors are ITEK (cameras), Contraves Goerz (telescopes), and RCA Services (operations and maintenance). Avco Everett Research Laboratories, Everett, MA, operates the Maui Optical Tracking and Identification Facility (MOTIF). General Electric is installing the GPS-10 radar and extending the range of the Diyarbakir (Pirinclik) FPS-79 radar. GTE Sylvania is upgrading the ALTAIR radar for near and deep space detection and tracking support. Western Space and Missile Center (WSMC) is Space Division's agent for Kaena Pt. Spacetrack improvements and implementation of the central Pacific Radar Barrier site. General systems engineering and technical support is provided by Lincoln Laboratory, Lexington, MA; Mitre Corporation, Bedfor , MA; and Aerospace Corporation, Los Angeles, CA.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

Project: 2295 Ground-Based Electro-Optical Deep Space Surveillance (GEODSS). Provides a global network of five sites to optically detect, track and identify satellites in earth orbit at altitudes of 3,000 to 22,000 nautical miles and beyond. Sites, in order of deployment, will be located at White Sands Missile Range, NM; Taegu, Korea; Maui, Hawaii; Diego G -cia] In 1982 the first three sites became operational. Diego Garcia equipment is built and await-

Program Element: #12424F   Title: Spacetrack
DoD Mission Area: #332, Strategic Surveillance and Warning   Budget Activity: #3, Strategic Program

ing constructon of the technical facility in FY 84. Contract award for site five equipment was held up by OSD deferral of funds until Air Force programmed funds for facilities. In FY 83, contract for site five equipment will be awarded and country-to-country agreement for locating site five [ ] will be signed. Charge-coupled device (CCD) sensors for improving system performance and long-term supportability will be built and tested. Program management responsibility for the first three sites will be transferred to Air Force Logistics Command. In FY 84, Diego Garcia equipment will be refurbished and modified (telescope mount hardware and software) to operate in southern latitude. Construction of the technical facility on Diego Garcia will begin. Testing of initial charge coupled device camera will be completed in preparation for production buy of CCD cameras in FY 85. Several enhancements to increase GEODSS operational effectiveness will be examined and tested including: dynamic scheduling, all sky camera for cloud monitoring, daylight operations, and satellite mission assessment improvements. Five site deployment of GEODSS will be completed in FY 86 when [ ] site will become operational. Retrofit replacement with CCD cameras will be completed in FY 87. Research and development will continue with evaluation, and potential implementation, of enhancements listed above as well as the following: addition of long wavelength infrared (LWIR), compensated imaging (visible) and radar sensors, mobile GEODSS systems and airborne GEODSS systems. This is a continuing program.

8. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

Project: 2296, Ground-Based Sensors. [ ] SPACETRACK space object identification/mission assessment capability and improves surveillance support for space defense. In FY 82, improved radar calibration system modifications were begun on selected SPACETRACK radars. This modification, previously demonstrated at Clear, Alaska site, improves [ ] accuracy of radars using the Navy Transit satellites as a reference. Modi- DARPA Long-Range Tracking and Instrumentation Radar (ALTAIR) on Kwajalein for low and high (geosynchronous) altitude tracking was completed and began final testing and evaluation. Modification of the radar at Diyarbakir (Pirinclik) to enable tracking at geosynchronous altitude also was performed. The GPS-10 redeployment to San Miguel, the Philippines, and modification of the Haystack long range imaging radar to improve its imaging capability and tactical responsiveness are also well underway. In FY 83, [ ]0 radar redeployment, and extended range modifications at ALTAIR and Diyarbakir will be completed. Improved radar calibration system modifications at selected SPACETRACK sites will continue. A deep space network control processor to provide system-level-coordinated operations of the deep space capable radars (ALTAIR, Millstone, Diyarbakir) and five GEODSS sites will be developed. Test and evaluation of the Compensated Imaging System on the DARPA Maui Optical Station (AMOS) 1.6 meter telescope will continue. In FY 84, improved radar calibration implementation will continue. Secure communications from Haystack to NORAD/SPACECOM will be installed. Search improvements to C-Band radars at Ascension and Antigua will be implemented. Planning for C-Band radar imaging upgrades and two additional Haystack-type Radars will be completed. Deployment of the surplus USNS Arnold C-Band radar to complete the Pacific Radar Barrier will begin. Modifications to incorporate the Kaena Point radar as a contributing SPACETRACK sensor will also begin. In FY 85 and beyond the modifications listed above will be completed. The Compensated Imaging System and DARPA 1.6 meter telescope will be transitioned to Spacecom. Outdated and unsupportable automatic data processing equipment at Spacetrack sites will be replaced on an "as required" basis. Continuing improvements to the SPACETRACK network will be made to support space defense requirements for warning and defensive counter measures and antisatellite operations. Survivability of SPACETRACK ground-based sensors will be increased by improvements to communications, electronic warfare countermeasures and physical security. The validated requirement for surveillance of retrograde Soviet launches will be addressed. This is a continuing program.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #12431F | Title: Defense Support Program

DOD Mission Area: Strategic Surveillance [ ] | Budget Activity: Strategic Programs, #3

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	145,750	120,287	48,669	53,906	Continuing	Not Applicable

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Defense Support Program (DSP) is the key element of the [ ] It is a space-based surveillance system that [ ] The system consists of three satellites in geostationary orbit, two large processing stations, one simplified processing station, one multi-purpose facility, and a ground communications network. The DSP provides [ ]

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY ($ in thousands):

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	145,750	120,447	50,275		Continuing	Not Applicable
Procurement (Missile)	241,354	407,500	366,300		Continuing	Not Applicable
Procurement (Other)	101,140	89,292	5,345		Continuing	Not Applicable

1/ FY 1984 RDT&E and Procurement (Missile) changes due to revised inflation indices.

2/ FY 1984 Procurement (Other) change due to increase in scope caused by peripheral replacement and ground station compatibility with new satellites.

4. (U) OTHER APPROPRIATION FUNDS ($ in thousands):

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Procurement (Missile)	241,400	404,900	356,930	35,836	Continuing	[illegible]
(Qty, Satellites)	Long lead	(2)	(2)	(0)		
Procurement (Other)						
(Includes initial spares)	100,106	87,792	28,913	59,740	Continuing	[illegible]
(Qty, Mobile Ground Terminals)	(2 MGTs)	(3 MGTs)				
Military Construction Program		1,900			[illegible]	
Operations and Maintenance (Software)	32,802	31,839	40,271	43,[illegible]	[illegible]	

Program Element: #12431F   Title: Defense Support Program
DOD Mission Area: Strategic Surveillance[ ]   Budget Activity: Strategic Programs, #3

5. RELATED ACTIVITIES: Program[ ]were predecessor programs. Program[ ]were prior program designators.[ ] are developing the technology for[ ] Appropriate procurement phasing with the follow-on Defense Support Program (DSP) is being addressed in program planning. Defense Satellite Communications System (P.E. 33110F) provides primary communications routing for DSP overseas data and will help provide Mobile Ground Terminal communications. Space Boosters (P.E. 35119F) provides launch support. Space Vehicle Subsystems Advanced Development (P.E. 63401F) is developing technology for improved satellite navigation, power, and propulsion systems.[ ] DSP is the key element of the Worldwide Military Command and Control Systems (WWMCCS)[ ]and is related to the other[ ]of the network (WWMCCS Architecture P.E. 63735F). The WWMCCS Architecture also provides systems engineering and integration technical support to the[ ] After transition to the Space Shuttle, Space Launch Support Program (P.E. 35171F) will provide Inertial Upper Stages and Space Shuttle flights for DSP missions. DSP Communications (P.E. 12447F) provides operations and maintenance for the DSP Ground Communication Network.

6. WORK PERFORMED BY: Commander-in-Chief, Aerospace Defense Command, maintains operational control of DSP for the Joint Chiefs of Staff. Strategic Air Command and the Air Force Communications Command are the system operators and maintainers of the DSP ground stations. Ground Station Operations will transition to Space Command during FY 1983. Air Force Systems Command's Space Division, Los Angeles, CA, has overall development and procurement management responsibility and program management of the satellites. The Air Force Logistics Command provides engineering and logistics support. Air Force Weapons Laboratory, Kirtland Air Force Base, NM, will provide facility support. The Air Force Test and Evaluation Center, Kirtland Air Force Base, NM, participates in test and evaluation of selected system segments. TRW, Redondo Beach, CA, is the prime contractor for the spacecraft and satellite integration. Aerojet Electro Systems Company, Azusa, CA, is the prime contractor for the infrared sensor and the computer replacement. The Department of Energy (Sandia Corporation) has responsibility for the[ ] IBM, Thousand Oaks, CA, is the prime contractor for all software efforts as well as the prime contractor on the Mobile Ground Terminals. The Aerospace Corporation, Inglewood, CA, furnishes general systems engineering/integration for the DSP System Program Office.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) PROJECT: Defense Support Program

A. PROJECT DESCRIPTION: The development of satellite transition to the Space Shuttle/Inertial Upper Stage and the Titan III (34D)/ Inertial Upper Stage will continue. All satellites from 14 and beyond will be launched with the Space Shuttle. The design of the hardware and software for the ground stations to be compatible with satellites 14-17 upgrades will begin. These upgrades include the satellite-to-satellite crosslink, the second color focal plane, the mis-

Program Element: #12431F   Title: Defense Support Program
DOD Mission Area: Strategic Surveillance[ ]   Budget Activity: Strategic Programs, #3

sion data message rebroadcast capability[ ] Satellites 16 and 17 will be procured on a fully funded basis using advance procurement material procured in FY 1982. Orbital operations support, satellite maintenance and other efforts associated with maintaining a three satellite operational force structure will continue. The replacement of the peripherals will be continued, as well as modifications to the operational software to support improved satellite capabilities.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) FY 82 Accomplishments: Defense Support Program (DSP) Flight 10 was launched on[ ]to replace Flight 8 which had lost its primary attitude determination system. The Flight 10 launch and checkout was successful and it was deployed[ ] This was the first launch of the[ ] The satellite 14-17 spacecraft design was continued through FY 1982 and the sensor design was completed with a Critical Design Review. The satellite 14-17 sensor includes the Sensor Evolutionary Development capability, the second color addition[ ]and a survivable star sensor which is the last major component on the satellite to be nuclear hardened. Advance procurement material for satellites 14-17 was put on contract in FY 1982. The Mobile Ground Terminal design was completed and the option for production units 2 and 3 was exercised. The critical design review included five major subsystems: data processing equipment, software, communications, antenna and transportation. The ground station computer replacement continued throughout FY 1982 with the replacement, checkout and operational software certification at the Multi-Purpose Facility at Lowry AFB, CO. The first of three operational computer strings was replaced at the Continental Ground Station (CGS). Planning and site preparation for the move of the Simplified Processing Station[ ]was completed. The Navy has expressed interest using the DSP[ ] A Navy observer spent a couple of months at the Overseas Ground Station investigating the use of this data. The Navy is evaluating the data and may request Air Force assistance[ ] The DSP operational system[ ]

(2) FY 1983 Program: The move of the Simplified Processing Station to[ ] has been completed. The purpose of this move was to increase the[ ] The production option for Mobile Ground Terminals 4-6 has been exercised. The satellite 14-17 spacecraft design is scheduled to be completed with a critical design review in May 1983. Improvements to the spacecraft include satellite-to-satellite crosslink and a mission data message rebroadcast capability. Production of the sensors and spacecraft for satellites 14 and 15 will begin. Integration of DSP satellites to the Titan III (34D)/Inertial Upper Stage and Shuttle/Inertial Upper Stage will continue. The first Sensor Evolutionary Development satellite will be delivered. The major improvements on these satellites are improved[ ]advanced thermal control and an[ ] The Jam Resistant Secure Communication terminals, which are the primary Mobile Ground Terminal communications capability, will be repackaged to meet the Mobile Ground Terminal requirements for[ ] The ground station computer replacement will be completed and the peripheral replacement will begin.

[ ]

Program Element: **#12431F** Title: **Defense Support Program**
DOD Mission Area: **Strategic Surveillance** [ ] Budget Activity: **Strategic Programs, #3**

(3) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The development of the satellite/launch vehicle compatibility will continue. The current plan is to launch the Defense Support Program (DSP) satellites on the following launch vehicle combinations: Satellites 12 and 6R on the Titan III (34D)/Inertial Upper Stage, satellite 5R on the Titan III (34D)/Transtage and satellites 14 and beyond on the Shuttle/Inertial Upper Stage. The design for the ground station compatibility with satellites 14-17 will begin in FY 1984. The ground station changes will be required because of the Defense System Acquisition Review Council (DSARC) direction to upgrade DSP survivability with satellite-to-satellite crosslink [ ] a second color focal plane [ ] a mission data message rebroadcast capability [ ] and [ ] The crosslink will necessitate front end changes to allow the crosslinked and noncrosslinked data to be separated for processing. In addition, adaptive equalizers will be used [ ] The second color focal plane will require software changes and some additional processing capability. The mission data message rebroadcast capability will require a new transmitter, [ ] will require software for automating more of the status and commanding and to determine satellite ephemeris. The above RDT&E cost estimates were generated by the program office using contractor inputs and experience on similar modifications in the past. Other planned efforts in FY 1984 are the procurement of satellites 16 and 17 (advance procurement material procured in FY 1982), completion of peripheral replacement funding, start of the Large Processing Station satellite 14 compatibility retrofit and modification of operational software to support the new satellites.

(4) (U) Program to Completion: This is a continuing program. RDT&E funding will support satellite/system development in support of Department of Defense requirements. Primary emphasis will be directed toward eliminating or minimizing operational employment deficiencies and vulnerabilities, the use of the Space Shuttle/Inertial Upper Stage in lieu of the Titan IIIC, the development of a survivable DSP system through Mobile Ground Terminals and satellite upgrades, and the adequacy of the ground station data processing capability.

C. MILESTONES: DATE

[ ]

D.	Delivery of Satellite #5	Mar 1973
[ ]		
F.	Delivery of Satellite #6	Jul 1973
G.	Delivery of Dual Satellite software	Feb 1974
H.	Delivery of Satellite #8	May 1974
I.	Delivery of Satellite #7	Oct 1974
J.	Delivery of Satellite #9	Mar 1975

[ ]

Program Element: #12431F
DoD Mission Area: Strategic Surveillance[ ]

Title: Defense Support Program
Budget Activity: Strategic Programs, #3

N.	Delivery of Simplified Processing Station (SPS)		Dec 1978
[			]
Q.	Retrofit of Titan III(34D)/Inertial Upper Stage (IUS) Compatible Satellite Complete		Jun 1981
[			]
S.	Move of the Simplified Processing Station to Europe		Nov 1982
T.	Retrofit of Satellite 5R complete	*(4Q CY 1982)	1Q CY 1983
U.	Completion of Computer Replacement		2Q CY 1983
[			]
W.	Satellite #14 Delivery	*(4Q CY 1985)	1Q CY 1986
X.	Satellite Launches		As required

* Date presented in FY 1983 Descriptive Summary.

EXPLAINATION OF MILESTONE CHANGES

T. Satellite delivery has slipped due to solder joint problem in the sensor.
V. IOC has slipped due to slip in design effort and to allow time for Initial Operational Test and Evaluation.
W. Slip due to the more definitive nature of the design and production programs.

Budget Activity: Strategic Programs, #3
Program Element: #12431F, Defense Support Program

Test and Evaluation Data

1. Development Test and Evaluation: The Defense Support Program has been designed, developed, tested and deployed as an operational system in the early 1970's. The system is a classified space program consisting of ground control and readout stations that receive data from satellites, process the data, and present [ ] information to the National Command Authorities and military commanders for decision-making purposes. The program manager is the Air Force System Command's Space Division. Space Command is the system operator. Development, Test and Evaluation/Initial Operational Test and Evaluation on the prototype Simplified Processing Station was completed in 1978. Over the next several years three major system upgrades will require Development Test, and Evaluation. They are the Sensor Evolutionary Development and [ ] upgrades; the Mobile Ground Terminals; and the Satellite 14 and beyond survivability upgrades. The Sensor Evolutionary Development satellites will have an increasing number of [ ] The major system improvements resulting from this increase is as follows: [ ] During FY 82 the first satellite with an Advanced Atmospheric Burst Locator was launched and tested. These upgrades have three different elements: the satellite, the software modifications and the ground station upgrade which involves replacing the computers. The sensor portion of the satellite is being produced by Aerojet ElectroSystems Corporation, the [ ] sensor are produced by the Sandia Corporation, and the spacecraft is being produced and integrated by TRW, Incorporated. Development, Test and Evaluation will be performed at the Aerojet ElectroSystems Corporation and TRW facilities prior to government acceptance, which is scheduled for fiscal year 1983. The satellites will then be stored until there is a launch requirement. The computers are being replaced at all Defense Support Program locations by Aerojet ElectroSystems Corporation. This replacement is scheduled to be completed by fiscal year 1983. Development, Test and Evaluation is being accomplished on this replacement in conjunction with acceptance testing. The ground station peripheral replacement is funded in FY 83-84, and will be tested in the same manner as the computer replacement. The system software is being modified to accommodate the Sensor Evolutionary Development satellites by International Business Machines Corporation. Development, Test and Evaluation will be accomplished prior to turnover to Strategic Air Command scheduled for fiscal year 1984. When the first Sensor Evolutionary Development satellite is launched, Air Force Systems Command will accomplish a system level Development, Test and Evaluation to insure that all elements of the system work together, including the satellite, the ground station hardware and the software. The purpose of the Mobile Ground Terminals is to provide survivability to the Defense Support Program ground processing and communication elements through mobility. They will use the same computer hardware and software as the Simplified Processing Station. The prime contractor is International Business Machines Corporation. Development, Test and Evaluation will be accomplished on the antenna which is new and at the Mobile Ground Terminal system level to ensure that the Mobile Ground Terminal can meet its mobility and communication goals. Primary communications are provided by the Mobile Communications Terminal which will be repackaged to meet the Mobile Ground Terminal requirements. The repackaged Mobile Communication

Budget Activity: Strategic Programs, #3
Program Element: #12431F, Defense Support Program

Terminal will be included in the Development, Test and Evaluation. Satellite 14 and beyond will include several survivability upgrades directed by a Defense System Acquisition Review Council. [

] Development of these satellites started in late fiscal year 1981 and the first will be delivered in late fiscal year 1986. The ground station and software modifications are being defined. The Development, Test and Evaluation program for these upgrades will be similar to the Sensor Evolutionary Development, Test and Evaluation program.

2. (U) Operational Test and Evaluation:

a. Combined Development Test and Evaluation (DT&E) and Initial Operational Test and Evaluation (IOT&E) was performed on the Defense Support Program (DSP) prototype Simplified Processing Station (SPS) from 26 August 1978 to 6 November 1978 at Vandenberg Air Force Base, California. [ ] The Space and Missile System Organization (SAMSO) was responsible for DT&E while the Air Force Test and Evaluation Center (AFTEC), assisted by personnel from the Aerospace Defense Command (operating command for DSP), managed and conducted IOT&E.

b. [ ] The objectives were to evaluate the system's performance and to estimate the reliability, availability and maintainability of an operationally deployed system. The IOT&E report, October 1979, identified three major deficiencies which would prevent the SPS from being operationally useful. These were:

(1) [

(2) [

(3) (U) Excessive computer-generated message error rate - Mission messages were periodically rejected at the data distribution center because of parity error. As a result, mission messages were lost.

c. Additionally, the IOT&E operational availability was[ ]

d. [

]

Budget Activity: Strategic Programs, #3
Program Element: #12431F, Defense Support Program

e. [

]

f. The systems integration office (SIO) at HQ ADCOM conducted a two-step certification process of the SPS, initially for low-speed teletype and later for high-speed data. The SIO certification was completed in May 1982, resulting in an SPS limited operational capability on 26 May 1982. CINCNORAD was briefed on 30 August regarding SPS status and approved proceeding to full operational capability (FOC) on 2 September 1982. [

]

g. (U) The total SPS OT&E effort identified 84 deficiencies and 26 program enhancements. AFTEC terminated its monitor role upon declaration of FOC.

h. AFTEC monitored the SAC-conducted phase I IOT&E of the DSP large processing station upgrade (LPSU) [

] Testing was deferred until IOT&E phase II due to the limited equipment configuration at the [ ] Phase II began 15 September at [

] and is expected to be completed by 31 December 1982. The LPSU is a system which shall provide the DSP with a maintainable ground computer environment at CONUS and overseas ground stations to satisfy current program requirements and to accommodate the new sensor evolutionary development (SED) by an upgrade of the current data reduction central (DRC) system. The upgrade includes the replacement of some DRC hardware components with off-the-shelf equipment and minor software changes for the new equipment. Six separate computer hardware strings will be delivered to operational system and tested. One string is at the [

]

i. (U) OT&E for the sensor evolutionary development satellites 5R/6R, ground communication network upgrade, and the satellite 14-17 upgrades is currently in advance planning.

j. (U) Test planning is in progress for the AFTEC managed IOT&E of the DSP mobile ground system (MGS). Time frame for the MGS IOT&E is early 1985. The MGS is being developed to enhance the survivability of DSP data in pre-, trans-, and post-attack environments through use of mobile, truck mounted data processing, and communications terminals, i.e., moble ground terminals (MGTs) and moble communications terminals (MCTs) respectively. The MGT element of the system completed final critical design review (CDR) in July 1982 and fabrication of the terminals is underway. The MCTs will be repackaged, Army-provided Jam Resistant Secure Communication terminals. Contractor selection for this repackaging effort is underway.

Budget Activity: Strategic Program, #3
Program Element: #12431F, Defense Support Program

k. (U) OT&E Reports published:

(1) (U) SPS IOT&E Test Plan Final Report, October 1979 (S).

(2) (U) SPS Phase I FOT&E Final Report, April 1980 (S).

(3) (U) SPS Phase I FOT&E Final Report, October 1981 (S).

3. System Characteristics:

Characteristics	Objectives	Demonstrated

For the current operational system

Simulation/
Live Events
Simulation/Live Events
Simulation/Live Events
Simulation/Live Events
Operational
Operational
Simulation/Live Events
Simulation/
Limited Live Events

Improvement for Sensor Evolutionary Development and Advanced Atmospheric Burst Locator

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #12432F — Title: PAVE PAWS Expansion
DoD Mission Area: Strategic Surveillance & Warning, # 332 — Budget Activity: Strategic Programs #3

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimate Costs
	TOTAL FOR PROGRAM ELEMENT	3,174	2,570	3,756	6,104	Continuing	Not Applicable

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The PAVE PAWS Sea Launched Ballistic Missile (SLBM) early warning system is being expanded and upgraded [ ] to the Southeast (SE) and Southwest (SW) of the Continental United States (CONUS), [ ] The expansion will consist of two new PAVE PAWS phased array radars, one each in the SE and SW. These will complement the two sites now in operation at Otis AFB, MA, Northeast, and Beale AFB, CA, Northwest; and along with the Perimeter Attack Characterization Radar (PARCS) in North Dakota, will complete the planned five-site phased array SLBM warning system.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY ($ in thousands):

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimate Costs
RDT&E	3,786	2,570	4,295		Continuing	Not Applicable
Procurement (Other)	0	69,433	113,981		Continuing	Not Applicable

On the basis of a more clearly defined estimate of program cost and schedule, funds were moved within the program element from the FY 84 RDT&E and Procurement lines into the FY 85 RDT&E line and the FY 84 and 85 Military Construction lines.

4. (U) OTHER APPROPRIATION FUNDS ($ in thousands):

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimate Cost
Procurement (Other)*	0	68,587	105,745	30,945	Continuing	Not Applicable
Military Construction	0	0	4,980	6,761		
Operations & Maintenance (Acquisition Related)	0	0	2,976	1,973		

* Includes initial spares

Program Element: #12432F | Title: PAVE PAWS Expansion
DoD Mission Area: Strategic Surveillance & Warning, # 332 | Budget Activity: Strategic Programs #3

5. RELATED ACTIVITIES: The PAVE PAWS Sea Launched Ballistic Missile (SLBM) Early Warning System is part of the national system for Tactical Warning and Attack Assessment. It provides confirmation of initial launch detection information provided by the[ ]and complements the information provided by the Ballistic Missile Early Warning System (BMEWS), and NORAD Space Detection and Tracking System. PAVE PAWS data is provided directly to the North American Aerospace Defense Command (NORAD), the National Military Command Center, and the Strategic Air Command Command Center and to other users via the 427M system and World Wide Military Command and Control System (WWMCCS).

6. (U) WORK PERFORMED BY: Air Force System Command, Electronic Systems Division, Bedford, MA, in conjunction with NORAD/Aerospace Defense Command. Space Command, Strategic Air Command, and Air Force Communications Command. General system engineering will be provided by the Mitre Corporation of Bedford, MA. Competition will be solicited for the building of the two new sites. However, the new sites will be very similar to the first two, and Raytheon Corp. of Wayland, MA, which was the prime contractor for the Otis and Beale sites, may be the only respondent.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984: Not Applicable.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) PROJECT: (PAVE PAWS Expansion is all in one project.)

A. PROJECT DESCRIPTION: The existing Sea Launched Ballistic Missile (SLBM) detection and warning system consists of the Otis and Beale PAVE PAWS, the MacDill AFB FSS-7, the PARCS radar in North Dakota and the FPS-85 radar in Florida. [

] The proposed two new sites will[ ]provide significantly improved tactical warning and attack assessment. When the SE site is fully grown to the 10db configuration it can assume the NORAD space tracking mission now being done by the FPS-85. This will allow us to close that site along with the MacDill site.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

1. (U) FY 82 Accomplishments: Site surveys were completed in the Southeast and Southwest. Tentative site locations are Robbins AFB, GA and Goodfellow AFB, TX. The environmental impact analysis has been initiated for both sites and preparation of a solicitation to industry is underway.

2. (U) FY 83 Program: Contract award in Mar 83 and begin construction of the SE site.

Program Element: #12432F
DoD Mission Area: Strategic Surveillance & Warning, # 332

Title: PAVE PAWS Expansion
Budget Activity: Strategic Programs #3

3. FY 84 Planned Program and Basis for FY 1984 RDT&E Request: In FY 84 we plan to begin deployment of the new SW PAVE PAWS site and to add 10db of radar power aperture growth to the SE site. Deployment of the SW site [. . .]in our Sea Launched Ballistic Missile (SLBM) coverage and complete the five site all phased array network. The 10db growth to the SE site will enable it to pickup the spacetracking mission now performed at the FPS-85 radar. This will permit us to close both the FPS-85 and the FSS-7 radars. Cost estimates for the FY 84 requirement are based on extrapolation of detailed cost experience data obtained during the building of the Otis and Beale PAVE PAWS sites. This assumes that the two new sites will be very similar in design to the original sites.

4. (U) Program to Completion: In FY 85, we will replace the site computers at the Otis and Beale sites. with the same type of machines used in the new SE and SW sites. The new computers will replace 10 year old existing equipment, will assure continued logistics supportability, promote hardware and software commonal , and expand the site's capacity to process the much larger missile threats of the mid-1980s. Also in FY 85 we wil egin construction of a Tactical Warning Sensor Technical Support Center (TWSTSC) which will be used to maintain PA 'AWS software and serve as a training facility for operations and maintenance personnel. Initial operational capabili IOC) for the new SE site will in FY 86. IOCs for the SW site and TWSTSC will be in FY 87.

C. (U) MAJOR MILESTONES:

MAJOR MILESTONES	DATES
1. ADCOM GOR 1-78	May 78
2. Contract Award	Mar 83
3. 10db SE site IOC	Sep 86
4. TWSTSC IOC	Oct 87
5. SW site IOC	Mar 87
6 Otis site computer replacement complete	Mar 88
7 Beale site computer relacement complete	Sep 88

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #12433F/31357F

Title: Integrated Operational Nuclear Detonation Detection System (IONDS)

DoD Mission Area: Strategic Surveillance and Warning, #332
General Defense Intelligence Programs, #312

Budget Activity: Strategic Programs, #3
Intelligence and Communications, #5

1. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	11,474	21,881			Continuing	Not Applicable
12433F		6,974	19,885	30,474	35,457	Continuing	Not Applicable
31357F		4,500	1,996			Continuing	Not Applicable

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Integrated Operational Nuclear Detonation Detection System (IONDS) is being developed to provide a capability to detect, locate, and report in near real time nuclear detonations on a global basis. IONDS will provide data to satisfy strategic, tactical, and nuclear test ban treaty monitoring requirements. The program plan calls for integration of sensors on the NAVSTAR Global Positioning System (GPS) satellites and ground readout and display equipment for a number of varied users, e.g., the National Command Authorities, commanders of theaters and unified/specified commands, Air Force Technical Applications Center, and the Federal Emergency Management Agency.

support are the primary wartime benefits of data derived from the IONDS sensor network. PE 31357F is a General Defense Intelligence Program element and is included to show the complete IONDS funding profile.

3. COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

12433F	RDT&E	6,974	19,885	9,470[1]
	Msl Proc			0[1]
	Other Proc			21,253[2]
31357F	RDT&E	4,500[3]	1,996	[ ]
	Msl Proc	16,435	22,455	

[1] The FY 84 increase of 12433F RDT&E funds ($21.8M) and Missile Procurement funds ($13.7M) is for development and procurement of the [ ] This additional sensor is necessary to increase IONDS location accuracy [ ] This increased accuracy will allow [ ]

[2] (U) The $21.3M decrease in 12433F Other Procurement funds for FY 84 was due to rephasing the procurement of user terminals to more closely align them with satellite procurement.

[3] (U) The $16M decrease in 31357F Missile Procurement funds for FY 82 was reprogrammed to the GPS program to initiate the production block buy in FY 82.

[4] (U) The $2.6M increase in 31357F Missile Procurement funds for FY 84 was an adjustment due to refinement of the cost estimates.

Program Element: #12433F/31357F

Title: Integrated Operational NUDETS Detection System (IONDS)

DoD Mission Area: Strategic Surveillance and Warning, #332
General Defense Intelligence Programs, #312

Budget Activity: Strategic Programs, #3
Intelligence and Communications, #5

4. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
12433F Msl Proc		2,000	13,430	21,287	Continuing	Not Applicable
Other Proc			0	10,060		
31357F Msl Proc	435	22,455	[ ]	[ ]		

5. RELATED ACTIVITIES: IONDS sensors will be integrated on the Global Positioning System (GPS) satellites (PE 64778F and 35165F) beginning with the next GPS launch in mid 1983. NUDET sensors are currently deployed on [ ] and on satellites of the [ ] Development and production of the NUDET sensors for IONDS/GPS is being funded by the Department of Energy, with support from [ ]

6. (U) WORK PERFORMED BY: Development and procurement is accomplished by Hq Space Division, Los Angeles, CA, with the assistance of the Air Force Technical Applications Center, Patrick AFB, FL. Rockwell International, Downey, CA, completed preliminary Global Positioning System/IONDS interface studies during FY 1976 and is currently under contract to integrate IONDS sensors on GPS satellites. Ford Aerospace and Electronics Co., Palo Alto, CA, performed System Definition Studies in FY 1976 and is continuing to provide systems engineering support. Sandia Corporation, Albuquerque, NM, will develop and produce the nuclear detonations sensors.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

A. PROJECT DESCRIPTION: PE 12433F funds the portion of IONDS RDT&E and procurement for the electromagnetic pulse sensor, satellite data cross links and user terminals. PE 31357F funds the integration of the basic IONDS package on board the GPS satellite. IONDS data are necessary for the NCA, and unified and specified commanders to properly manage their forces during war based on information relative to strike and damage assessment. [ ]

Program Element: #12433F/31357F

DoD Mission Area: Strategic Surveillance and Warning, #332
General Defense Intelligence Programs, #312

Title: Integrated Operational NUDETS Detection System (IONDS)

Budget Activity: Strategic Programs, #3
Intelligence and Communications, #5

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) (U) FY 1982 Accomplishments: The final four validation phase GPS spacecraft will have IONDS packages aboard. The first of these four has been completed and the second was delivered in Oct 82. The other two are still in build-up. Critical Design Review was completed on the production phase Qualification Test Vehicle, including an IONDS package.

(2) FY 1983 Program: The FY 1983 program will support integration of IONDS sensors on NAVSTAR Global Positioning System (GPS) satellites and continues development of a satellite-to-satellite data crosslink, and [ ] The data crosslink will assure transmission of IONDS data in near real time on a global basis and the [ ] will improve IONDS' location accuracy to provide [ ] strike/damage assessment capability. Additionally, a contract will be let in mid-FY 1983 to develop the ground and airborne production terminals. These terminals are being designed for compatibility with the E-4B and EC-135 airborne command posts and ground based command centers.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The IONDS program is intended to provide very accurate nuclear detonation location information. Key elements in obtaining this information is the extremely precise timing and global coverage provided by the GPS constellation of satellites. Therefore, the IONDS validation and production phases exactly match that of GPS. Launch of the final R&D satellite is planned. Work will continue on the production spacecraft leading to the first deliveries in FY 85. Development of the ground and airborne user terminals, beginning in FY 83, will progress, with the preliminary design review scheduled for FY 84. The cost estimates were derived from a Program Office cost evaluation using contractor estimates, historical data from similar efforts, and cost estimating relationships. These cost estimates were last validated in Aug 82

(4) (U) Program to Completion: This is a continuing program. Design and production activities are keyed to the GPS schedule.

C. (U) MAJOR MILESTONES

MAJOR MILESTONES	DATES
Defense Systems Acquisition Review Council II	2Q CY 79
Begin Satellite Production	3Q CY 82
Defense Systems Acquisition Review Council III	2Q CY 84
Shuttle Launch First Satellite	4Q CY 85
Achieve Worldwide 2-D Capability	3Q CY 87
Achieve Worldwide 3-D Capability	4Q CY 88

FY 1984 RDT&E DESCRIPTIVE SUMMARY

PROGRAM ELEMENT (PE): # 12436F
DoD MISSION AREA: STRATEGIC INFORMATION SYSTEMS, #334

TITLE: COMMAND CENTER PROCESSING AND DISPLAY SYSTEM
BUDGET ACTIVITY: STRATEGIC PROGRAMS, #3

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands)

PROJECT NUMBER	TITLE	FY 1982 ACTUAL	FY 1983 ESTIMATED	FY 1984 ESTIMATED	FY 1985 ESTIMATE	ADDITIONAL TO COMPLETION	TOTAL ESTIMATED COST
	TOTAL FOR PROGRAM ELEMENT	0	0	4,874*	11,272	23,921	55,175

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Strategic Air Command (SAC) Statement of Need (SON) 1-80 (validated) identified the need for an upgraded Command Center Processing and Display System (CCPDS). [

] The CCPDS upgrade will replace the current Automatic Data Processing Equipment at SAC, NORAD Cheyenne Mountain Complex (NCMC), National Military Command Center (NMCC), and the Alternate National Military Command Center (ANMCC). This will provide the decision makers at each of the four command centers a consolidated, common presentation for evaluation of the missile threat. Improved communications systems and displays will allow the processing capability
[ ]

* Due to an administrative error, an excess of $15,108 is reflected in the budget details under this program element. The $15,108 should be reflected in the budget details under PE 12310F (WWMCCS ADP-NORAD/ADCOM). See Descriptive Summary on PE 12310F for appropriate justification.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY ($ in thousands) Not applicable--this is an FY 1984 New Start.

4. (U) OTHER APPROPRIATION FUNDS ($ in thousands)

Procurement (Other)**	0	0	2,856	4,314	21,479	28,649
Military Construction	0	0	0	0	0	0

** Includes initial spares

5. (U) RELATED ACTIVITIES: The System Operations Concept (SOC), System Hardware and Software Acquisition Specifications, Request for Proposal (RFP) and Statement of Work (SOW) documentation are being developed during FY 1983 by the Tactical Warning/Attack Assessment (TW/AA) Engineering Directorate at Electronic Systems Division (ESD). Additionally, ESD will conduct a comprehensive independent cost study to validate the programmed funds. These efforts are funded in PE #12313F, Ballistic Missile Tactical Warning/Attack Assessment Support.

6. (U) WORK PERFORMED BY: Prime contractors have not yet been identified. Preliminary acquisition documentation is being developed by Mitre Corporation. Mitre is a Federal Contract Research Corporation (FCRC) located in Bedford, MA.

PROGRAM ELEMENT (PE): #12436F
DoD MISSION AREA: STRATEGIC INFORMATION SYSTEMS, #334

TITLE: COMMAND CENTER PROCESSING AND DISPLAY SYSTEM
BUDGET ACTIVITY: STRATEGIC PROGRAMS, #3

7. (U) COMMAND CENTER PROCESSING AND DISPLAY SYSTEM (SINGLE PROJECT LESS THAT $10 MILLION IN FY 1984): April 1984 is the target date for award of a concept definition contract to at least two contractors. The competitive phase will provide the government trade studies and alternate system architectures to help determine the most mission responsive, cost effective solution to the Command Center Processing and Display System (CCPDS) Replacement Program. The concept definition effort is an FY 1984 New Start and is expected to last one year. The contractor whose architecture, cost and management approach is most responsive to Air Force requirements will be awarded the follow-on development.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #32015F — Title: National Emergency Airborne Command Post
DOD Mission Area: #331-Strategic Command and Control — Budget Activity: #3-Strategic Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	8,365*	24,014*	20,927	24,311	18,751	464,849
2211	Block I	3,493*	5,234*	1,010	4,000	5,100	379,693
2212	Future Blocks	4,872*	18,780*	19,927	20,311	13,651	85,149

* FY 83 and prior year funding for the E-4 is contained in Program Element (PE) 11312F. Effective with FY 84 all E-4 funding has been transferred to PE 32015F.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The overall objective of the E-4 Program is to develop and acquire the E-4B system to support the National Emergency Airborne Command Post mission. The E-4 provides significant improvements in capability, survivability and reliability for the command and control of strategic forces in the pre, trans, and post attack phases of a general nuclear war. In FY83 and prior years, the E-4 Program was contained in PE 11312F. Effective in FY84, the E-4 program is moved to PE 32015F to reflect the single mission of the four E-4 aircraft program.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In thousands)

RDT&E	9,365*	24,034*	34,366*	Continuing	N/A
Procurement (Aircraft) Project 2211	107,800*				470,000
Procurement (Aircraft) Project 2212	200*	7,800*	10,800*	Continuing	N/A

* Funding for the E-4 was contained in PE 11312F in the FY 83 Descriptive Summary.

Program Element: #32015F Title: National Emergency Airborne Command Post
DOD Mission Area: #331-Strategic Command and Control Budget Activity: #3-Strategic Programs

(U) RDT&E reductions in FY82 and FY84 are attributable to revised cost estimates for tasks contained in Project 2212. The new estimates more accurately identify the scope of these efforts and the man-years necessary to effectively accomplish the development.

(U) Procurement changes for Project 2211 in FY82 and Total Estimated Cost result from a re-assessment of the costs for certain hardware items that were planned to be contractor furnished but were in fact government furnished items.

(U) Procurement changes for Project 2212 in FY82 and FY83 result from revised estimates for kit procurement and necessary spares.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Procurement (Aircraft) (Project 2211)	106,000*					469,600
(Quantity Retrofit)	(1)					(4)
Procurement (Aircraft) (Project 2212)	200*	7,900*	12,900	14,300	Continuing	N/A
Military Construction**						19,700
Operations and Maintenance (PE72207)***	45,900	93,200				139,100

* FY83 and prior year funding shown under PE 11312F
** Military Construction Funds are all prior year funding
*** Installation funds for retrofit of E-4A to E-4B

5. (U) RELATED ACTIVITIES: Strategic Air Command Communications, PE 11316F; Air Force Satellite Communications Program, PE 33601F; System Survivability, PE 64711F; Electromagnetic Radiation Test Facilities, PE 64747F; Air Force Support to Minimum Essential Emergency Communications, PE 33131F; the Defense Support Program, PE 12431F; Post Attack Command and Control System, PE 11312F; and Integrated Operational NUDET Detection System, PE 12433F.

Program Element: #32015F | Title: National Emergency Airborne Command Post
DOD Mission Area: #331-Strategic Command and Control | Budget Activity: #3-Strategic Programs

6. (U) WORK PERFORMED BY: The Air Force System Command, Electronics Systems Division, L.G. Hanscom AFB, MA, has responsibility for the program. The Boeing Company, Seattle, WA, was the prime contractor for the development of the E-4B. The contract for modification of the E-4As to the E-4B configuration was awarded to the Boeing Company, Seattle, WA with E-Systems, Greenville, TX being a major subcontractor.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

(U) Project 2211, E-4 Block I: The objective of this project is to procure three interim E-4A aircraft, development of an E-4B aircraft and the retrofit of the three E-4A aircraft to a standard E-4B configuration for a total fleet of four aircraft. FY82 accomplishments include continued contractor support for the development aircraft. The contract option on the third and last retrofit aircraft was exercised on 7 October 1981. The FY83 program continues support for the E-4B and initiates planning for an additional Electromagnetic Pulse Test on the Trailing Wire Antenna System. It is planned to conduct this test in calendar year 1985. The first retrofit aircraft will be delivered in July 1983. Program Management Responsibility Turnover (PMRT) will take place in October 1983 and the second retrofit aircraft will be delivered in May 1985. Final aircraft delivery is currently scheduled for January 1985.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: 2212 E-4 Block II

A. (U) Project Description: The objective of the project is to ensure that then E-4 aircraft system will maintain compatibility with existing and evolving elements of the Worldwide Military Command and Control System, update logistically outdated equipment and provide improved capabilities. Current modifications planned for the E-4B include: Automated Data Processing, Replacement High Frequency Radios, multiple Super High Frequency Satellite Channels, improved low frequency receive capability, a Single Channel Transponder message injection transmit capability and the addition of an Integrated Operational NUDET Detection System (IONDS) Terminal. Of these programs only the multiple Super High Frequency Channels and the Single Channel Transponder injection system require RDT&E funding in the E-4 program. This is due to the complexity of integrating the systems into the E-4B aircraft.

Program Element: #32015F | Title: National Emergency Airborne Command Post
DOD Mission Area: #331-Strategic Command and Control | Budget Activity: #3-Strategic Programs

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The engineering and development necessary to incorporate the four additional Super High Frequency Satellite channels into the existing single channel satellite terminal was begun. The prototype E-4B Automated Data Processing System (developed under a separate program) was installed on the development E-4B aircraft.

(2) (U) FY 1983 Program: Continues development of the multiple Super High Frequency Satellite channels. Initiates the engineering and development required to support installation of a Single Channel Transponder message injection capability. This system will allow the aircraft to transmit a Super High Frequency message to a satellite for subsequent rebroadcast to force elements. This task will require a complex interaction between two satellite terminals and a totally revised antenna pointing system.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Continues development of the E-4 multiple channel Super High Frequency Defense Satellite Communications System terminal for the E-4B and the integration of the Single Channel Transponder capability to the existing Air Force Satellite Communications System terminal and the Super High Frequency Satellite terminal. The major tasks that will be accomplished are the activation of a system integration laboratory to support the development of components for the Single Channel Transponder injection capability and the integration of these components with the current E-4B Super High Frequency terminal and the Air Force Satellite Communications System terminal. This laboratory will allow full testing of the total system prior to installation in the aircraft which minimizes both the technical risk and cost. This effort must take place in FY84 to allow prototype installation in the E-4B in FY85. Cost Estimates were developed based on past experience within the E-4 Program. Similar integration, system integration laboratories and test programs were accomplished during the initial development program for the E-4B. Costs are based on the assumption that the effort would be accomplished as an Engineering Change Proposal to the E-4 Production Contract.

(4) (U) Program to Completion: This is a continuing program. Completion of development, engineering, prototyping and testing of the multiple Super High Frequency (SHF) channel and SHF Single Channel Transponder (SCT) uplink program will occur. The remaining aircraft will receive these systems as Class V modifications. Additional future improvements will be provided by the Worldwide Airborne Command Post Modification Program.

Program Element: #32105F
DOD Mission Area: #331-Strategic Command and Control

Title: National Emergency Airborne Command Post
Budget Activity: #3-Strategic Programs

C. (U) Major Milestones:

Project 2211

Milestones	DATE	Milestone	Dates
SAC QOR Submitted	Apr 1966	Turnover to User	Jan 1980
Program Start	Dec 1972	DSARC III	May 1980
E-4B Program Start	Dec 1973	Contract Award for Retrofit	Jun 1980
Three E-4As Operational	Sep 1975	Retrofit 1 delivery	Jul 1983
IOT&E Complete	Feb 1979	Retrofit 2 delivery	May 1984
Aircraft Delivery to AF	Dec 1979	FOC (4 A/C)	Jan 1985

Project 2212

Milestones	DATE	Milestone	DATES
Joint User Prioritized List	Sep 1980	FOC ADP (4 A/C)	Mar 1985
Initial Implementation Plan	Jan 1981	Prototype for SHF Channels	Mar 1985
Prototype ADP System	Mar 1982	Prototype for SCT	Jun 1985
Initiate Development of SHF Channels	Mar 1982	FOC for SHF Channels (4 A/C)	Sep 1986
Initiate Development of SCT	Oct 1982	FOC for SCT (4 A/C)	Jun 1987

Budget Activity: Strategic Programs, #3
Program Element: #32015F, National Emergency Airborne Command Post (E-4)

Test and Evaluation Data

1. (U) Development Test and Evaluation: Phase 1A - Modification of the first airframe with the interim Command Control and Communications was completed in September 1974 by E-Systems, Greenville, TX. Development Test and Evaluation and Initial Operational Test and Evaluation were completed in December 1974. Federal Aviation Administration recertification of the aircraft was accomplished. The installed Command Control and Communications mission equipment was removed from the EC-135 National Emergency Airborne Command Post aircraft. Development Test and Evaluation of this equipment included electromagnetic interference and compromising emanations investigation as well as total system evaluation. The second and third aircraft were delivered for operational use after two months of acceptance testing.

(U) Phase 1B - The E-4B Development Test and Evaluation program concentrated primarily on the integration and installation of the advanced command control and communications package and subsequent system level testing of the operational aircraft. Testing of the Boeing 747 airframe with structural modifications (including in-flight refueling, antenna mountings, new aircraft generators) was also accomplished to maintain Federal Aviation Administration certification. In addition, initial low level electromagnetic pulse tests were conducted on the E-4A type airframe to assist in evaluation of later testing of the electromagnetic pulse hardened E-4B system. Development Test and Evaluation of the advanced command control and communications package was initiated in early 1977 with the pretesting of selected components and subsystems by the prime development contractor, the Boeing Company, Seattle, WA. Initial aircraft testing, both ground and airborne, was accomplished during the latter part of 1977 by the major subcontractor, E-Systems of Greenville, TX after installation of equipment racks, wiring, fixtures, environmental control system, and selected mission equipment. The testing at E-Systems verified the aircraft modifications and substantiated the performance of selected mission subsystems. The E-4 Program is managed by the Electronic Systems Division of Air Force Systems Command. This agency was responsible for all Development Test and Evaluation efforts. Systems were operated and maintained by contractor personnel and personnel from the Strategic Air Command.

(U) Systems Level Test - The testbed aircraft was delivered to the Boeing Plant in January 1978 for installation of the Super High Frequency Satellite Communications terminal, antenna radome, and the Very Low Frequency/Low Frequency communications subsystem. System level ground tests began in February 1978 and airborne tests of the system began in June 1978. Special test instrumentation, which was used to verify specification performance, was removed from the aircraft in September 1978 prior to starting the final operational verification of the total airborne system. Development Test and Evaluation was concluded on 17 December 1978 after completing a total of forty test flights. A system level electromagnetic pulse test was conducted between February and June of 1979 at Kirtland Air Force Base, New Mexico. Additional ground and airborne tests were conducted between October and December 1979. These tests were to verify performance of systems added during refurbishment such as a new satellite terminal and an improved low frequency communications system. This final phase of Development Test and Evaluation was concluded on 15 December 1979 with a total of eight flights. The E-4B was delivered to the Air Force on 21 December 1979 and turned over to the Strategic Air Command for operational use on 7 January 1980. While some problems were discovered during this extensive Development Test and Evaluation, the problems were resolved and subsequent testing has verified that the E-4B performs in accordance with system specifications.

Budget Activity: Strategic Programs, #3
Program Element: #32015F, National Emergency Airborne Command Post (E-4)

(U) Phase 1C - With the exception of Electromagnetic Pulse testing, no significant Development Test and Evaluation will be required during this phase; however, acceptance testing of all aircraft will be accomplished after installation of the advanced command control and communications configuration. The Defense System Acquisition Review Council III Decision Memorandum of 5 June 1980 approved production of the E-4B. It also directed additional electromagnetic pulse testing be conducted with emphasis on the Trailing Wire Antenna. These tests will take advantage of improved test facilities and methodology over what was available at the time of the original system level electromagnetic pulse test. It is currently planned to conduct this additional testing in calendar year 1985.

2. (U) Operational Test and Evaluation: The operational test and evaluation of the E-4 is being conducted in phases as appropriate for the various phases of the E-4 program. The testing phases with the test objectives and the results (if completed) are as follows:

(U) An Initial Operational Test and Evaluation of the E-4A was conducted by Headquarters Command and the Organization of the Joint Chiefs of Staff on the first Phase 1A interim aircraft at Andrews Air Force Base, Maryland, in December 1974. The primary objective of that Initial Operational Test and Evaluation was to determine if the E-4A could effectively perform the National Emergency Airborne Command Post mission and be operated and maintained using existing assigned personnel, interim base facilities, and contractor logistics support. Upon completion of Initial Operational Test and Evaluation, it was concluded that the E-4A system could perform the basic National Emergency Airborne Command Post mission while being operated and maintained as planned.

(U) Initial Operational Test and Evaluation of the Phase 1B test bed E-4B aircraft, conducted by the Air Force Test and Evaluation Center, began in combination with Development Test and Evaluation ground tests at E-Systems from September to December 1977. It continued from January through December 1978 as part of the combined Development Test and Evaluation and Initial Operational Test and Evaluation at The Boeing Company in Seattle, WA. A 47-day separate Initial Operational Test and Evaluation beginning 27 December 1978 at Offutt Air Force Base, NE, followed the combined Development Test and Evaluation/Initial Operational Test and Evaluation The separate Initial Operational Test and Evaluation testing included 13 flights (125.7 hours) in the operational environment with deployments to Andrews Air Force Base, MD, (the National Emergency Airborne Command Post forward operating base) for ground alert evaluation and to Howard Air Force Base, Canal Zone, for hot weather selfsustained ground alert evaluation. During this test period, the E-4B particiapted in both a Joint Chiefs of Staff POLO HAT exercise and a Strategic Air Command GIANT STAFF exercise. These exercises closely simulated the operational environment, and allowed a side-by-side comparison with currently operational aircraft, the E-4A and EC-135. During the separate Initial Operational Test and Evaluation the aircraft was operated and maintained by Air Force personnel from the Strategic Air Command, Office of the Joint Chiefs of Staff, and Air Force Communications Command. The separate Initial Operational Test and Evaluation was completed on 11 February 1979 with a test flight that delivered the aircraft to Kirtland Air Force Base, New Mexico, for start of the system-level Electromagnetic Pulse Development Test and Evaluation at the Air Force Weapons Laboratory.

Budget Activity: Strategic Programs, #3
Program Element: #32015F, National Emergency Airborne Command Post (E-4)

(U) The Initial Operational Test and Evaluation test team was composed of personnel from the Air Force Test and Evaluation Center, Air Force Logistics Command, Air Force Systems Command, Air Training Command, Air Force Communications Command, Strategic Air Command, Office of Joint Chiefs of Staff, Air Force Security Service, and the School of Aerospace Medicine. The operational mission requirements of both the Strategic Air Command and the Office of Joint Chiefs of Staff/National Emergency Airborne Command Post served as the basis for the evaluation. Major objectives were to estimate operational effectiveness and suitability, and to identify deficiencies.

(U) As a result of the Initial Operational Test and Evaluation, it was concluded that the E-4B aircraft will provide an improved command, control, and communications capability for the airborne command post missions of the Joint Chiefs of Staff and the Strategic Air Command. The test bed aircraft, as configured during Initial Operational Test and Evaluation, demonstrated satisfactory operational effectiveness, but was deficient in reliability, maintainability and availability. Test results are contained in the Advanced Airborne Command Post (E-4B) Initial Operational Test and Evaluation Final Report(S) dated November 1979.

(U) Operational deficiencies were discovered in certain subsystems during the Initial Operational Test and Evaluation phase; however extensive efforts were taken to correct these deficiencies. Appropriate fixes were incorporated for the majority of these problems during the aircraft refurbishment phase, and resolution of any remaining problems is being accomplished as engineering solutions are developed. In addition, several new subsystems were installed during this same refurbishment period to attain the production configuration. Following the successful completion of the postrefurbishment testing, Air Force Test and Evaluation Center found the operational effectiveness to be satisfactory and projected the operational suitability (reliability, maintainability, and availability) to be satisfactory based on satisfactory correction of several deficiencies in the suitability area. The E-4B program was presented at Defense Systems Acquisition Review Council III on 1 May 1980. DSARC III on 5 May 1980. Postrefurbishment test results are contained in the Advanced Airborne Command Post (E-4B) Initial Operational Test and Evaluation Final Report Annex A (S) dated May 1980. As a result of data obtained during the IOT&E and the EMP DT&E testing, the overall survivability of the E-4B was rated satisfactory. Test results are contained in the Advanced Airborne Command Post (E-4B) Initial Operational Test and Evaluation Final Report Annex B (S) dated March 1981.

(U) The E-4B follow-on operational test and evaluation (FOT&E) was conducted by Headquarters SAC and the Organization of the Joint Chiefs of Staff (OJCS) NEACP Advanced Projects Office and concluded on 31 August 1981. Testing was adequate except that the production AN/USC-28 satellite communications modem was not available for evaluation. The production modem was subsequently installed and testing was completed in May 1982 with satisfactory results. During the FOT&E the reliability of low frequency and very low frequency communications systems was determined to be unsatisfactory. Subsequent corrective actions have resolved the reliability problems. The Airborne Command Post E-4B Follow-on Test and Evaluation Test Report was published in March 1982.

Budget Activity: Strategic Programs, #3
Program Element: #32015F, National Emergency Airborne Command Post (E-4)

3. (U) System Characteristics: The significant E-4B performance objectives and demonstrated performance are shown below. All objectives were demonstrated during Development Test and Evaluation.

(U) Operational	Objective	Demonstrated Performance
Unrefuled Time on Station (hours)	12	12
Maximum Payload (pounds) (E-4B)	150,000	150,000
Maximum Personnel Complement	94	94
Maximum Gross Taxi Weight (pounds) (E-4B)	803,000	803,000
Maximum Take-off Thrust (pounds)	201,400	201,400
(U) Technical		
Electrical Power (Kilo Volt Amperes)	1200	1200
Ultra High Frequency Satellite Communications		
a. Bandwidth (Kilo Hertz)	5	5
b. Bit Error Rate/Bits Per Second	$10^{-3}/75$	$10^{-3}/75$*
Super High Frequency Satellite Communications (Bit Error Rate/Bits Per Second)	$10^{-3}/75$ $10^{-6}/1200$ $10^{-5}/2400$ $10^{-3}/9600$	$10^{-3}/75$* $10^{-6}/1200$* $10^{-5}/2400$* $10^{-3}/9600$*
Command Radio Power (Watts)	30	30
Automatic Switching System Connections (Lines)	111	111
Automatic Digital Network Terminal (Bit Error Rate/Bits Per Second)	$10^{-5}/2400$	$10^{-5}/2400$*
Low Frequency/Very Low Frequency Power Output (Kilo Watts)	200	200*

*Meets or exceeds contractural guarantees

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 33131F Title: Minimum Essential Emergency Communications Network (MEECN)
DOD Mission Area: #333 Strategic Communications Budget Activity: #3 Strategic Programs

1. RESOURCES (PROJECT LISTING): ($ in Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	41,633	49,591	132,294	81,679	Continuing	N/A
2832	VLF/LF Improvements	28,183	39,199	46,043	54,335	Continuing	N/A
2834	Groundwave Emergency Network (GWEN)	10,000	8,000	74,543	15,476	0	108,019
2833	Adaptive High Frequency Communications	3,450	2,392	11,708	11,868	27,200	56,618

2. BRIEF DESCRIPTIONS OF ELEMENT AND MISSION NEED: This element is the Air Force portion of a continuing program supporting the Chairman, Joint Chiefs of Staff, who is responsible for delivery of decisions of the National Command Authority in a precise and timely manner to[Current emphasis is on improved command and control communications in the very-low-frequency, and high-frequency bands to improve survivability, endurability, and performance under adverse nuclear and jamming conditions.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in Thousands)

RDT&E	45,429	49,606	40,053	N/A	Continuing	N/A
Procurement (Other)	-	-	89,935	N/A	Continuing	N/A
Procurement (Aircraft)	-	-	-	-	Continuing	N/A
PE 11142F	12,500	14,700	17,200	N/A		
PE 11312F			2,700	N/A		

Program Element: #33131F Title: Minimum Essential Emergency Communications Network (MEECN)
DOD Mission Area: #333 Strategic Communications Budget Activity: #3 Strategic Programs

(U) Explanation of Differences

(U) RDT&E FY 84: Project 2832 increased by $18,849 K due to repricing of the miniaturized receive terminals for bombers based on better cost data. Also, improvements for the trailing wire transmit antenna were added as a result of testing on the 100 KW airborne transmitter program. Project 2834 was increased $67,543 K based on an independent cost estimate and a better definition of the operational requirements. This includes $4,000k transferred from AFSATCOM (PE 33601) resulting from changes in the satellite terminal program for Minuteman launch control centers. Project 2833 was increased by $5,849 K adding effort for high frequency antijam work.

(U) Procurement (Aircraft)

(U) FY 82, FY 83, FY84: VLF/LF Improvements (Project 2832) was reduced by $7,100 K, 14,700 K, and 19,900 K in FY 82, FY 83, and FY 84 respectively because the 100 KW airborne transmitter did not begin production.

(U) Procurement (Other)

(U) FY 84: GWEN (Project 2834) was reduced by $89,935 K because of a realignment of development and production.

4. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Procurement (Other)	0	0	0	70,065[1]/	Continuing	N/A
Procurement (Aircraft)						
PE11312F	-	-	-	5,600	Continuing	N/A
PE11142F	5,400	-	-	-	Continuing	N/A
PE32105F	-	-	-	500	Continuing	N/A

1/ Contains both equipment and intial spares.

5. (U) RELATED ACTIVITIES: Modifications to ground and airborne systems resulting from improvements developed under this program are funded in several program elements including PE 11142F, KC-135 Squadrons, PE11312F, Post Attack Command And Control System, and PE 32105F, National Emergency Airborne Command Post.

6. (U) WORK PERFORMED BY: Primary contractors are Westinghouse Electric Corporation, Defense and Electronic Systems Center, Baltimore, Maryland (jam-resistant modulators/demodualtors and high-power (100-kilowatt) airborne transmitter for EC-135 aircraft); Spears Associates, Norwood, Massachusetts (horizontally polarized airborne receive antenna); Sonicraft, Incorporated, Chicago, Illinois (diversity reception equipment); Analytical Systems Engineering Corporation, Burlington, Massachusetts (system engineering support); and R&D Associates, Marina Del Ray, CA (Groundwave Emergency Network). Electronic Systems Division located at Hanscom Air Force Base, Massachusetts, has managerial responsibility for the Research, Development, Test, and Evaluation, with support from the Rome Air Development Center, Air Force Logistics Command, Strategic Air Command, and other Air Force major commands.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 84:

A. (U) Project: 2833, Adaptive High Frequency (HF) Communications: The adaptive HF program will develop a new generation of military HF radios and implement state-of-the-art advances in HF systems to provide communications in nuclear and jamming environments. HF radio provides an economical means for long haul and airborne command and control for a large majority of military forces. HF improvements are needed to ensure connectivity under the degraded conditions expected during a nuclear conflict. The program need is based on validated operational requirements written by the Strategic Air Command, the Military Airlift Command, and the Joint Chiefs of Staff. In FY 82, adaptive HF concept (including automatic frequency monitoring and call initiation) were demonstrated. System design, modification design requirements, and testing will continue in FY 83 and FY 84. Production should begin in FY 85.

8. (U) PROJECT OVER $10 MILLION IN FY 84:

(U) Project: 2832, VLF/LF Improvements

A. Project Description: The Minimum Essential Emergency Communications Network consists of systems specifically designed to

Communications in the very-low-frequency and low-frequency regions of the spectrum have attributes useful in strategic communications. These include low ambient propagation loss, significant penetration of sea water, and relatively good performance in a nuclear disturbed environment. This project consists of improvements to our existing very-low frequency/low-frequency communications system to extend range, improve resistance to jamming and nuclear effects, and increase message accuracy at all ranges. The system consists of (1) airborne transmitters and receivers in EC-135 and E-4 airborne command post aircraft; (2) transmitters and receivers at fixed ground locations in Silver Creek, Nebraska, and at Hawes, California; and (3) receivers at Strategic Air Command wing command posts, intercontinential ballistic missile launch control centers, and northern area radio relay sites. The system improvements are based upon validated requirements of the Strategic Air Command and the other Single Integrated Operational Plan Commanders-in-Chief, system deficiencies as reported by the Defense Communications Agency, and priorities of the Joint Chiefs of Staff.

Program Element: # 33131F Title: Minimum Essential Emergency Communications Network (MEECN)
DOD Mission Area: #333 Strategic Communications Budget Activity: #3 Strategic Programs

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Development and testing was completed for the horizontially polarized airborne receive antenna. Production and installation was begun via an aircraft modification contract. Development of the 100kw airborne transmitter was completed but testing was stopped due to failures in the aircraft transmit antenna system. (The antenna was not part of the development program.) An investigation of alternative antenna solutions was initiated. Full scale development contract on the diversity reception equipment was awarded in June 82. Source selection for the Miniaturized Receive Terminals for bombers began in June 82.

(2) (U) FY 1983 Program: The Systems Requirements Review for the Diversity Reception Equipment was held in November 82. Full scale development will continue in FY 83 with the System Design Review and Preliminary Design Review scheduled in FY83. Contract award for the validation phase of the Miniaturized Receive Terminal is anticipated in January 83. Solutions for the transmitter antenna problems are expected in March 83 followed by a request for proposal for a new antenna system. A preliminary study for a replacement printer will also be accomplished.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The request includes funds to continue development of the upgrades to our current Survivable Low Frequency Communication System (487L). Full scale development will continue for the Diversity Reception Equipment (DRE) with the critical design review scheduled this year. The Miniaturized Receive Terminal (MRT) validation design will be continued and testing will begin. Full scale development for an improved trailing wire airborne transmit antenna will begin. (This includes any necessary retrofits the 100kw transmitter.) The cost estimate for DRE are based on the contractor proposal while estimates for MRT and the improved antenna are based on independent cost estimates done by HQ Electronics System Division. Estimates are based on competitive procurements.

(4) (U) Program to Completion: The development programs will be completed for the DRE (FY86), MRT (FY86), and improved transmit antenna (FY86). These programs will then transition into production. However, this is a continuing program which must assure that a high probability of successful communications to strategic forces is maintained as the threat to such communications evolves.

C. (U) Major Milestones:

Milestones	Date
A. 100 KW Airborne Transmitter	
- Contract Award	Oct 79
- Development Complete	Nov 82

Program Element: #33131F Title: Minimum Essential Emergency Communications Network (MEECN)
DOD Mission Area: #333 Strategic Communications Budget Activity: #3 Strategic Programs

B. Horizontal Polorized Airborne Receive Antenna Contract Award	
- Development Contract Award	Jul 80
- Production Contract Award	Aug 82
- FOC	FY 84
C. Diversity Reception Equipment	
- Development Contract Award	Jun 82
- Production Contract Award	Mar 86
- FOC	FY 90
D. Miniaturized Receive Terminals	
- Validation Contract Award	Jan 83
- Development Contract Award	Feb 85
- Production Contract Award	Dec 86
- FOC	FY 90
E. Improved Trailing Wire Airborne Transmit Antenna	
- Development Contract Award	Nov 84
- Production Contract Award	Jun 87
- FOC	FY 89

9. (U) PROJECT OVER $10 MILLION IN FY 84:

(U) Project: 2834, Groundwave Emergency Network

A. Project Description: The Minimum Essential Emergency Communications Network consists of systems specificially designed to[, Communications in the low-frequency region of the spectrum have attributes useful in strategic communications. These include low ambient propagation loss and relatively good performance in a nuclear disturbed environment. This project will define, develop, test, and deploy a proliferated groundwave communications system. The purpose of this system is to provide US strategic forces with the ability to maintain critical CONUS long range command and control communications connectivity despite disruptions induced by physical damage as well as ionospheric disturbances caused by nuclear detonations. Survivability for this system is provided primarily by proliferated relay nodes, using unmanned, EMP-hardened, jam-resistant, groundwave radio equipment. Strategic force commanders and units (equipped with EMP-hardened, jam-resistant, secure radio equipment) interact with nearby relay nodes for participation in the overall network. The Groundwave Emergency Network program will be structured to provide survivable and enduring connectivity[ ] to CONUS commanders, bomber and tanker forces, and missile launch control centers.

Program Element: #33131F Title: Minimum Essential Emergency Communications Network (MEECN)
DOD Mission Area: #333 Strategic Communications Budget Activity: #3 Strategic Programs

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 82 Accomplishments: A contract was awarded in June for a nine station network for proof of concept and development of software potocols, user interfaces, and EMP hardening techniques. Network hardware and software design was begun. This phase is called the Initial Connectivity Capability (ICC). As a result of the decision to cancel the satellite terminal program for the missile launch control centers (LCC), GWEN terminal installation in LCCs will be accelerated to provide an alternate means of survivable connectivity.

(2) (U) FY 1983 Program: Design for the Initial Connectivity Capability will be completed in January and installation will begin in June and completed by September. Full scale development for the operational network will begin in February with two contractors. Each design will be evaluated and one will be selected by September for fabrication and deployment. The initial operational network consisting of approximately 45 stations is called the Thin Line Connectivity Capability.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: This request includes funds for fabrication and deployment of the prototype Thin Line Connectivity Capability network providing EMP hardened connectivity between warning sites, major command centers and bomber, tanker, and missile control centers. Network interfaces for airborne command post aircraft will also be developed. Budget figures are based on an independent cost estimate done by Hq Electronics System Division for a competitive procurement.

(4) (U) Program to Completion: The prototype network will be completed by December 84 and testing will be accomplished between January and March 1985. Production will begin in April and continue through FY 89. Approximately 300 stations will ultimately be deployed.

C. (U) Major Milestones:

Milestones	Date
A. Initial Connectivity Capability	
- Contract Award	Jun 82
- Installation	Jun 83
- Test Complete	Dec 83
B. Thin Line Connectivity Capability Contract Award	
- Contract Award	Feb 83
- Design Complete	Sep 83
- Development Complete	Dec 84
- IOC	Mar 85
- FOC	FY 89

FY 1984 RDT&E DESCRIPTIVE SUMMARY

PROGRAM ELEMENT: #33152F TITLE: WWMCCS INFORMATION SYSTEM
DOD MISSION AREA: 391 STRATEGIC PROGRAMS BUDGET ACTIVITY: 3, STRATEGIC PROGRAMS

1. (U) RESOURCES ($ IN THOUSANDS)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
TOTAL FOR PROGRAM	0	5,000	25,257	35,342	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: PE includes manpower authorizations, peculiar and common support equipment, necessary facilities and the associated costs for resources directly associated with planning, designing, developing, procuring, leasing, programming, operating and maintaining Automated Data Processing (ADP) systems for the World Wide Military Command & Control System (WWMCCS) Information System (WIS). The existing WWMCCS ADP System, which was acquired in the early 1970s, is rapidly becoming obsolete and increasingly difficult and uneconomical to maintain and operate. Modernization of the current ADP capabilities is needed to provide a responsive command and control system for the National Command Authority, the Joint Chiefs of Staff (JCS) and the Commanders in Chief (CINCs) and subordinate commands.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ IN THOUSANDS)

RDT&E	0	8,366	7,287	N/A	Continuing	N/A
PROC	N/A	N/A	N/A			

4. (U) OTHER APPROPRIATION FUNDS:

O&M	N/A	4,075	8,738	12,386	Continuing	N/A
MILCON	N/A	0	0	0	490	490
PROCUREMENT	N/A	0	0	5,779	Continuing	N/A

5. (U) RELATED ACTIVITIES: PEs 11313F, 41841F, 33151F fund the current WWMCCS ADP system within the AF. PE 33152F includes funds to support the WIS transition at AF sites, will fund for the procurement of all WIS ADP for the AF in the 1986-1990 time frame and also for the development of the joint portions of the WIS. PE 33152N includes R&D funds that will also be used to fund the JPM program (8,600 in FY 84 and 14,600 in FY 85). PE 33152A also includes R&D funds for the same purpose (9,800 in FY 84 and 16,700 in FY 85).

6. (U) WORK PERFORMED BY: The WIS Joint Program Manager (JPM) is responsible for this program and directs the precursor effort described in paragraph 7. The Air Force Systems Command, Electronic Systems Division is responsible for the development and acquisition of WIS hardware and software. The primary contractors for the FY 1982 program are shown.

There were an additional 8 contractors in FY 1982. The total contracted effort for the 13 contractors in FY 82 for the WIS modernization was $6.2 million. The FY 1982 contracts were principally for the transtion precursors (proof-of-concept development activities and preplanned product improvement efforts). Funding for these contracts was provided from DCA.

NAME	LOCATION
Teledyne Brown	Rockville, MD
TRW	Arlington, VA
Logicon	Rosslyn, VA
SAI	McLean, VA
Tandem	Falls Church, VA

7. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS: There are no separate projects in this program. Differences from the 1983 Descriptive Summary reflect the establishment of a Joint Program Manager for WIS; other FY 82 accomplishments are described in paragraph 7B. The funding profiles for FY 83-85 will not provide adequate funds to complete the program described below. Internal OSD program budget decisions are being effected at more than three times the FY 83 amount, more than six times the FY 84 amount and more than ten times the FY 85 amount.

A. (U) Program Description: WIS is a multi-phased, multi-contract program designed to modernize the software and hardware of the current WWMCCS ADP System. The program includes the transition from current WWMCCS ADP to the new WIS stressing the modernization of software first. The use of multiple contracts will provide a competitive environment with built-in checks and balances to strive for maximum competition at the least cost to the government. The program provides for the modernization of the WWMCCS ADP for all Services and the Defense Communications Agency and Defense Nuclear Agency. The program began with R&D transition precursors efforts with the goal of reducing downstream technical, schedule, and cost risks, and providing modernized facilities.

B. (U) FY 1982 Accomplishments: The JCS recommendation for a Joint Program Manager for WIS was approved by the Deputy Secretary of Defense who designated the Chief of Staff, Air Force as the WIS Executive Agent. The USAF established a Joint Program Management Office and a System Program Office to design, develop and manage the implementation of WIS in response to JCS validated requirements. A plan for WIS modernization was provided to Congress and participating operational commanders. In concert with this report, near-term improvements to the current system and proof-of-concept development activities and preplanned product improvement efforts called transition precursors have been initiated by the JPM to enhance the connectivity, survivability and security of WIS.

C. (U) FY 1983 Program: The thrust of the 1983 program is to award an integration contract and to continue the transition precursor effort. The integration contractor's work will begin in FY 1983 and continue into FY 1989. His tasks in FY 83 will include building a work force of over 100 people for the first 27 months of this contract and beginning the preparation and maintenance of a detailed definition of WIS, development of a site installation and integration plan, definition of a security approach and planning for the establishment of a Development Evaluation Facility (DEF). A prototype Automated Message Handling (AMH) system is being installed at the U.S. Rediness Command site. Prototype work in the area of computer security is being initiated at U.S. Army Forces Command Headquarters. Demonstration of the WIS Local Area Network (LAN) architecture is being conducted on a network at the DCA-Reston testbed facility.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: In Fiscal Year 1984, the WIS modernization program will center on work performed under three contracts - the integration contract, common user contract and contract for independent verification and validation (IV&V) of software and hardware development. In addition, the precursor effort will continue. The integration contractor's tasks will continue to include the identification and initial implementation for software development tools and methodologies. The common user contract will develop common user software and local area network interface. The IV&V contract will build a configuration management system and develop criteria for verification and validation of software and hardware. Precursor efforts, in distributed processing, relational data structures, automated software documentation, software engineering as an organizational process using the Distributed Software Engineer Control Process, and machine independent software using the DOD Ada computer language will converge to provide a prototype multi-node modernized Joint Deployment System for planning and executing the movement of conventional forces. Successful completion of these projects will validate concepts designed to reduce the cost, schedule, and technical risk of the remaining program. The program is currently in the demonstration and validation stage and the results will be consolidated prior to a DSARC II in mid FY 84.

The cost estimate used for this program is a parametric preliminary estimate. The data available for that estimate were accurate but the baseline cost estimate to be completed in FY 1983 will use additional data and more specific parameters for the WIS program. The estimate reported to the Congress in July 1982 is based on multiyear development and procurement. The last comprehensive review of the estimate was made in July 1982.

(4) (U) Program to Completion: The anticipated program go-ahead decision of DSARC II will result in follow-on contracts with both the Integration and Common User contractors for engineering development based on proven concepts. Major software modernization efforts will be started. The formal Request for Proposal for the Joint Mission Contract (responsible for all jointly acquired hardware) will be released. Training on the use of transition phase facilities will begin. All modernization of software will be completed. The Joint Mission Standard hardware will be selected. The completed system will be deployed. Training on new systems and facilities will be accomplished.

C. Major Milestones:

Milestones	Dates
A. Local Area Network Demonstration Start	Jan 1983
B. WIS Security Prototype	Jan 1983
C. WIS Auto Message Handling Prototype Deployment	Apr 1983
D. Integration Contract Award	Jul 1983
E. Common User Contract Award	Nov 1983
F. Independent Verification and Validation Contract Award	Jun 1984
G. Selection of Joint Mission Standard Hardware	Apr 1986
H. Joint Mission Hardware Contract Award	Jun 1986

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: 33601F — Title: Air Force Satellite Communications (AFSATCOM) System
DoD Mission Area: #333 - Strategic Communications — Budget Activity: #3 - Strategic Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	79,201	46,129	188,552	169,553	Continuing	Not Applicable
2478	Air Force Satellite Communications	79,201	46,129	188,552	169,553	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program consolidates the development of the ground and aircraft satellite communications terminals needed for operation with the AFSATCOM and MILSTAR satellite systems to satisfy critical needs of the National Command Authorities and the military Commanders-in-Chief for reliable, worldwide communications for command and control of the strategic nuclear forces and other high priority users.

3. (U) COMPARISON WITH FY 83 DESCRIPTIVE SUMMARY: ($ in thousands)

Research, Development, Test and Evaluation	80,114	50,901	29,945	-	Continuing	Not Applicable
Procurement (Missile)	0	28,600	31,500	-	Continuing	Not Applicable
Procurement (Other)	14,448	10,448	67,240	-	Continuing	Not Applicable

(U) Explanation of funding differences:

A. (U) RDT&E

FY 1982 - After an exhaustive review within the Air Force, the planned Super High Frequency (SHF) Upgrade for the missile launch control center satellite terminals was cancelled. Development (and procurement) funds were reallocated to initiate development of a (MILSTAR) Extremely High Frequency (EHF) receive capability at the launch control centers. The difference shown resulted primarily from this reallocation and more refined cost estimates.

FY 1983 - Changes resulted from Congressional reductions to overall Air Force R&D program, reallocations to accomplish the changes described above and redistribution to other high priority Air Force programs.

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FY 1984 - Funds were reallocated within the program element to accommodate the above changes. In addition, some funds were transferred to PE 33131F to accelerate the Ground Wave Emergency Network program for the missile launch control centers. The most significant change was the transfer of all development (and procurement) funds for Air Force MILSTAR terminals to the AFSATCOM Program Element beginning in FY 1984. Further details regarding this transfer are contained in paragraph 8B.

B. (U) Missile Procurement

FY 1982/83/84 - Differences resulted from revised inflation indices.

C. (U) Other Procurement

FY 1982 - The changes resulted from the withdrawal of funds as directed by the Deputy Secretary of Defense for a higher priority special project and the restructuring of the planned terminal upgrade program.

FY 1983 - Differences resulted from revised inflation indices.

FY 1984 - Production funds for the Super High Frequency (SHF) Upgrade for the missile launch control center terminals were deleted.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Procurement (Missile)	0	28,400	30,693	13,994	Continuing	Not Applicable
Quantities (Satellite Transponders)	0	0	1	1		
Procurement (Other) (includes initial spares)	9,243	10,307	9,942	81,060	Continuing	Not Applicable
Quantities (Terminals/Terminal Modifications*)	5	8	187*	34/224*		

Program Element: #33601F | Title: Air Force Satellite Communications (SATCOM) System
DoD Mission Area: # 333 - Strategic Communications | Budget Activity: # 3 - Strategic Programs

5. (U) RELATED ACTIVITIES: Procurement of aircraft terminals and planned upgrades are funded in the weapons system programs. Approved Air Force users include the following program elements: 11113F, B-52; 11126F, B-1B; 11142F, RC-135; 11312F, EC-135; 11115F, FB-111; 32015F, E-4; 27222F, KC-10A; and 11213F, Minuteman Launch Control Centers. The AFSATCOM program also is a supporting system for the overall Minimum Essential Emergency Communications (MEECN) System, 33131F. The Minuteman Intercontinental Ballistic Missile program will integrate the satellite terminals into the launch control facilities. Additional users include the Navy TACAMO Program and Army Nuclear Weapons Storage Sites. Program Element 33603F, MILSTAR, will develop and acquire the next generation satellite communications system. Funds for spacecraft and related development and production are contained in Program Element 33603F. Funds for development and acquisition of MILSTAR terminals for the Air Force have been transferred to the AFSATCOM Program Element. Program Element 33110F, Defense Satellite Communications System (DSCS) funds host spacecraft and will fund and procure the single channel transponders beginning in FY 1982. The Satellite Data System, Program Element 35158F, and Program Element 33109N, Navy Satellite Communications, are the major satellite systems hosting Air Force Satellite Communication System transponders. Additional Fleet Satellite Communications satellites are programmed in PE 33109N.

6. (U) WORK PERFORMED BY: The Air Force Satellite Communications System is managed by the Space Division, Los Angeles Air Force Station, CA. Support facilities include the Camp Parks, CA, Satellite Test Facility. The transponders on the Satellite Data System are built by Hughes Aircraft Company, EL Segundo, CA, and on the Fleet Satellite Communications System by TRW INC, Redondo Beach, CA. The terminal development/production is managed by the Electronics Systems Division, Hanscom AFB, MA. Terminal development was conducted by the Collins Telecommunications Products Division of Rockwell International, Cedar Rapids, IA. Terminal production is managed by the Collins Communications Systems Division of Rockwell International, Newport Beach, CA. System modems are produced by the Linkabit Corp, La Jolla, CA. The single channel transponders that will be deployed on the Defense Satellite Communications System spacecraft were developed by General Electric, Valley Forge, PA. The ground-based terminal equipment used for communications through the single channel transponders is being produced by Stanford Telecomunications, Inc., Sunnyvale, CA. Federal Contract Research Center support is provided by the Aerospace Corporation, Los Angeles, CA; MITRE Corporation, Bedford, MA and Lincoln Laboratory, Lexington, MA.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: # 2478 - Air Force Satellite Communications (AFSATCOM) System (single project in program element)

A. (U) Project Description: The Air Force Satellite Communications (AFSATCOM) System is a satellite-based, operational, Ultra-High Frequency (UHF) system that provides command and control communications for the National Command Authority, the Joint Chiefs of Staff, Commanders-in-Chief of the US nuclear forces and other selected high priority users. The satellites used in the AFSATCOM system are multi-mission satellites and support other missions besides AFSATCOM. These non-dedicated satellites include Fleet Satellite Communications System satellites in geostationary orbits, Satellite Data System satellites in high inclined polar orbits, and other classified host spacecraft.

Program Element: #33601F Title: Air Force Satellite Communications (AFSATCOM) System
DoD Mission Area: # 333 - Strategic Communications Budget Activity: # 3 - Strategic Programs

Together, these satellites provide communications for users in the entire northern hemisphere and to 70 degrees south latitude in the southern hemisphere. Terminals are installed in or are programmed for strategic bombers, airborne and ground command centers, Minuteman missile launch control centers, reconnaissance aircraft, nuclear weapons storage sites (Army funded) and in Navy aircraft (TACAMO) providing communications connectivity to the submarine fleet (Navy funded). Single channel transponders are being developed and produced to provide increased system survivability and will be installed on Defense Satellite Communications System (DSCS III) and Satellite Data System satellites. Terminal improvements are planned which will not only enhance performance in the presence of jamming and provide service to more users on existing channels but will also provide the means for a smooth transition to MILSTAR with minimal interruption in service to the operational users.

B. Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: Installation of terminals in strategic bomber and reconnaissance aircraft, missile launch control centers, and airborne/ground command centers has continued. As of 31 December 1982, over 400 terminals have been installed. Development of the single channel transponder (SCT) has continued and will provide increased electromagnetic and physical survivability for Emergency Action Message dissemination. Development and testing of the ground-based equipment required for communications via the SCT was completed and the production contract was awarded in September 1982. Development was initiated for system control and monitoring equipment required for more effective management of the various networks and to identify unauthorized users of the satellites. A comprehensive and exhaustive review of the previously planned terminal upgrade programs was initiated to insure that these upgrades provide for an operationally acceptable and cost effective transition to the MILSTAR satellite system. Participants in this process included the developing commands, using commands, Hq USAF, the Joint Staff, and the OSD staff. As a result of this review, the following direction and guidance was issued from Hq USAF:(1) the Super High Frequency (SHF) upgrade for the missile launch control center (LCC) terminals will be cancelled resulting in a savings of approximately $ 150 million, (2) the Ground Wave Emergency Network (GWEN) program funded in PE 33131F (3) a concept validation effort will be initiated for a MILSTAR Extremely High Frequency (EHF) receive capability in the LCC's, and (4) the planned anti-jam terminal improvements will be restructured and more closely integrated with MILSTAR terminal development to insure an orderly transition to the MILSTAR satellite system. Congress added RDT&E funds to the AFSATCOM Program Element in FY 1982 for MILSTAR development since, at that time, no MILSTAR program element existed. In FY 1982, multiple contracts were awarded for concept validation of: (1) MILSTAR spacecraft bus, (2) MILSTAR spacecraft payload, and (3) MILSTAR terminals.

(2) FY 1983 Program: Installation of terminals in strategic bombers, reconnaissance aircraft, missile launch control centers (LCC), and ground/airborne command centers will continue. Full Operational Capability (FOC) for AFSATCOM is scheduled to be achieved in December 1983. Development of the system control and monitoring equipment will be completed and production will begin. Production will be initiated for an AFSATCOM transponder

Production will contirue on the equipment required to provide communications through the single channel transponder (SCT). The first developmental SCT was launched on 30 October 1982 aboard the first Defense Satellite Communications System Phase III (DSCS III) satellite. Development will continue on the terminal upgrades which will: (1) improve performance in a jamming environment, (2) provide service for more users on existing channels, (3) improve connectivity between airborne command posts and nuclear weapons storage sites, and (4) provide for transition to the MILSTAR satellite system. A concept validation effort will be initiated for a MILSTAR Extremely High Frequency (EHF) receive capability in the missile launch control centers.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Includes funds to continue the terminal upgrades required for transition to MILSTAR as described above. After completion of concept validation begun in FY 1983, Full Scale Development of a MILSTAR EHF receive capability for the missile launch control centers will begin. Beginning in FY 1984, all development and production funds for Air Force MILSTAR terminals will be located in the AFSATCOM program element - 33601F. These funds were transferred from the MILSTAR program element - 33605F. The DoD has determined that separation of the funds for spacecraft and terminals will improve overall program management and permit increased visibility over this program at senior management levels within the Air Force and DoD. Additionally, this separation is consistent with current Army and Navy MILSTAR terminal funds management and will allow the Air Force to identify the MILSTAR spacecraft in a separate satellite-only program element. Full Scale Development of these terminals begun in FY 1983, will continue through FY 1984. The cost estimates for these efforts were obtained from prior experience with similar contracts, in-house cost estimating relationships and contractor estimates.

(4) (U) Program to Completion: This is a continuing program.

C. Major Milestones:

Milestones	Dates
(1) Development Start	Jan 1973
(2) Test and Evaluation Complete	Oct 1975
(3) Terminal Production Start	Dec 1976
(6) Fleet Satellite Communications System (F-1) Launch	Feb 1978
(7) First Terminal Delivery	Jun 1978
(8) Aircraft Terminal Installation Start	Jul 1978
(10) Initial Transportable Ground Terminals Installed	Mar 1979
(11) Fleet Satellite Communications System (F-2) Launch	May 1979
(12) Initial Operational Capability Achieved	May 1979
(13) Fleet Satellite Communications System (F-3) Launch	Jan 1980
(14) Fleet Satellite Communications System (F-4) Launch	Oct 1980

Program Element: #33601F
DoD Mission Area: # 333 - Strategic Communications

Title: Air Force Satellite Communications (AFSATCOM) System
Budget Activity: # 3 - Strategic Programs

(15) Ground Command Center Terminal Installation Start	Oct 1980
(17) Fleet Satellite Communications System (F-5) Launch	Aug 1981
(18) Missile Launch Control Center Terminal Installation Start	Dec 1981
(20) Single Channel Transponder Communication Equipment Production Start	Sep 1982
(21 Defense Satellite Communications System Phase III (DSCS III A-1) with Single Channel Transponder (SCT) Launch	Oct 1982
(21) AFSATCOM Terminal Upgrade Development Start	Jan 1983
(22) MILSTAR Terminal Full Scale Development Start	Jul 1983
(23) Full Operational Capability for AFSATCOM System**	Dec 1983

* These are dates when the Satellite Data System payloads are available to be launched. Specific launch dates are dependent upon replenishment requirements.

** This does not include any of the planned terminal improvements.

Budget Activity: Strategic Programs #3
Program Element: 33601F - Air Force Satellite Communications System

Test and Evaluation Data

1. (U) Development Test and Evaluation: The Air Force Satellite Communications System Terminals were developed by Rockwell International Corporation, Newport Beach, California (formerly Collins Radio Company, Cedar Rapids, Iowa). The terminals are designed on the modular concept, with capabilities ranging from single channel to simultaneous multi-channel, multiple satellite communications. Increases in capability are achieved by exchanging or adding modules. Development testing was conducted in-plant and as part of initial operational testing. This testing demonstrated that the technical performance of the system supported its intended use and confirmed expected theoretical performance. Transponders providing a single communications channel will be deployed on the Defense Satellite Communications System Phase III spacecraft as a modular and evolutionary approach to improving the Air Force Satellite Communications system. This single channel transponder and the associated ground transmission equipments were tested in each contractor's plant and together. These tests demonstrated the technical compatibility of the ground and space segments.

2. (U) Operational Test and Evaluation: The AFSATCOM Initial Operational Test and Evaluation (IOT&E) was combined with Developmental Test and Evaluation (DT&E) and managed by the Air Force Test and Evaluation Center (AFTEC). The combined test and evaluation program began in February 1975 and IOT&E was concluded in September 1975. The DT&E effort was extend to verify design fixes for identified equipment deficiencies.

(U) The IOT&E involved seven test sites (no ranges), six test aircraft, nine pre-production terminals, one satellite and a satellite simulator. Airborne terminals were installed on both operational and test aircraft. All four ground terminals were used in an operational configuration. Air Force personnel, trained either formally or on-the-job, operated the terminals to provide realistic operator/terminal interface evaluations. The number of operators used during any one test was the same as that expected during normal operating conditions for that terminal configuration. Trained operators were provided by the Strategic Air Command (SAC), Military Airlift Command (MAC), Air Force Communications Command (AFCC and Electronic Security Command (ESC). Contractor personnel were present to perform maintenance.

(U) Sixty-seven deficiencies were identified during IOT&E, prioritized by the using commands, and provided to the system program office for resolution. Sixty-six of these have been corrected and officially closed. The remaining deficiency is an electromagnetic compatability (EMC) problem between the AFSATCOM terminal and other systems on board the aircraft. Potential solutions to this problem are being examined by the Rome Air Development Center together with the AFSATCOM terminal program office.

Budget Activity: Strategic Programs #3
Program Element: 33601F - Air Force Satellite Communications System

(U) Follow-on operational test and evaluation (FOT&E) on the production terminals started in January 1980. AFTEC conducted phases I and II of the FOT&E (verification of fixes for IOT&E deficiencies and wideband network performance) from January 1980 through June 1982. SAC is conducting (AFTEC monitoring) phases III and IV (continued evaluation of operational effectiveness and suitability with continually increasing network complexity as more production terminals are fielded). Phases III and IV should be completed in June 1983. The FOT&E is being conducted using AFSATCOM transponders on Satellite Data System (SDS) and Fleet Satellite Communications (FLTSATCOM) satellites; production terminals (airborne and ground); and operational procedures developed by the using commands. The objectives are to evaluate performance in an operational environment and to verify reliability, maintainability, fixes to deficiencies, etc. The FOT&E is being conducted using operational assets employed on normal training missions to the maximum practical extent. SAC is the primary participant in the test. The operational terminals are being operated and maintained by the appropriate using agency personnel.

(U) The results of the AFTEC-conducted phases I and II of the FOT&E revealed that, although AFSATCOM offers a new capability for command, control, and communications, it did not entirely meet its expected performance because of deficiencies in both the operational effectiveness and operational suitability areas. There were eight deficiencies that were repeats of IOT&E deficiencies and occurred in the areas of hardware reliability, software effectiveness, technical data, and electromagnetic compatibility. These deficiencies are currently being reviewed by SAC and AFLC and will be addressed during Phases III and IV of FOT&E.

(U) HQ AFTEC has published two reports on AFSATCOM OT&E: (1) Final Report, Initial Operational Test and Evaluation (IOT&E), Air Force Satellite Communications Systems (U) AFSATCOM, December 1975 (report classified Secret) and (2) Air Force Satellite Communications (AFSATCOM) Systems Follow-on Operational Test and Evaluation Final Report (U), June 1982 (report classified Secret).

3. System Characteristics:

Characteristics	Objectives	Demonstrated	Demonstrated By
Data rate (Words/Minute)	100	100	Operational Test
Error Rate	[ ]	[ ]	Operational Test
Anti-Jam Protection (decibel/watt)			
Air Force Satellite Communications System	[ ]	[ ]	Development Test
Single Channel Transponder			
Ultra High Frequency	[ ]	To Be Determined	Development Test
Super High Frequency	[ ]	To Be Determined	Development Test
Mean time between failure	100 to 1,000 hours depending on terminal configuration	Yes	Development Test

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #33603F — Title: MILSTAR SATCOM System
DOD Mission Area: #333, Strategic Communications — Budget Activity: # 3, Strategic Programs

1. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0	117,627	149,908	[ ]	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The MILSTAR Satellite Communications System program is a Joint Service program to develop and acquire the new MILSTAR EHF satellite and new or modified terminals. The MILSTAR system is being designed to meet the minimum essential war time communications needs of the President and Commanders-in-Chief to command and control our strategic and tactical forces through all levels of conflict. It will also support other high priority users in crisis/contingency situations. The Air Force heads the MILSTAR Joint Program Office (JPO) which has overall responsibility and will manage the development and acquisiton of the space and mission control segments. Each Service will manage a terminal program (Air Force for airborne, Navy for shipborne and Army for ground) under the overall direction of the MILSTAR Joint Terminal Program Office managed by the Navy. This PE funds for development of the MILSTAR satellite and mission control segment. It also funds for procurement of the satellites.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

	79,784	256,990		Continuing	N/A

FY83: Congress added funds ($38M) to insure the directed first launch. DoD was instructed to address any FY84 shortfall.
FY84: Terminal development funds transferred to PE 33601F, AFSATCOM.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands) None in FY 84/85, however Missile Procurement will be required in the out years.

5. (U) RELATED ACTIVITIES: The MILSTAR Program was initiated in FY82 with funds in the Advanced Space Communication PE, 63431F, ($16M) and the Air Force Satellite Communications System (AFSATCOM) PE, 33601F, ($32M). The MILSTAR Satellite Communications System PE, 33603F, was created in the FY83 President's Budget submission and contained both satellite and terminal development funds. However, beginning in FY84, Air Force Extremely High Frequency (EHF) terminal development and procurement and terminal mission control segment procurement will be funded in the AFSATCOM PE (33601F) and only the MILSTAR satellite and its mission control segment development and acquisition programs will be funded in the MILSTAR PE (33603F). This is consistent with all other DoD satcom development and acquisition programs. In addition to developing the new MILSTAR satellite, the Air Force is also managing the development and acquisition of the EHF applique package on FLTSATCOM vehicle F-7 (and possibly F-8) which is funded in the Navy's EHF Satcom PE (64577N).

Program Element: #33603F
DOD Mission Area: #333, Strategic Communications

Title: MILSTAR SATCOM System
Budget Activity: #3, Strategic Programs

6. (U) WORK PERFORMED BY: The development of the MILSTAR satellite and the Mission Control Segment of the MILSTAR system will be managed by the Air Force Systems Command's Space Division, Los Angeles AFS, CA. A contract for FSED will be awarded in Apr/May 83 for the MILSTAR satellite development.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. PROJECTS OVER $10 MILLION IN FY 1984: MILSTAR SATCOM System (Program Element is single project)

A. Project Decription: This program will design, fabricate, test and acquire the new MILSTAR Extremely High Frequency (EHF)/Ultra High Frequency (UHF) satellite consisting of the mainframe (or "bus"), the communications payload, EHF and UHF antenna suite, [ ] and antennas and the satellite mission control segment. The system will incorporate state-of-the-art techniques for jam resistance and physical survivability. Key features are higher frequencies, bandspreading, on-board signal processing, end-to-end encryption, nulling antennas, hardening (both nuclear and laser), [ ] a high degree of autonomy and on-orbit storage. A special endurance feature of MILSTAR is the mission control segment which will allow selected command terminals to control the satellite as a backup to the CSOC (Consolidated Space Operations Center). A small UHF package will provide backward compatibility with the existing UHF system and facilitate the transition to EHF. This program will provide the required worldwide, two-way, jam-resistant secure, highly survivable and enduring communications capability.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Initiated Concept Validation study to define requirements and develop cost estimates.

(2) (U) FY 1983 Program: Complete Concept Validation study and begin Full Scale Development (FSD).

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The primary effort will be to continue system level engineering begun in FY83 leading to a Preliminary Design Review (PDR) in early FY 84. After PDR, detailed design will begin which will culminate in the Critical Design Review currently scheduled for FY85. Major emphasis will be placed on integration of the payload into the "bus", mating the satellite with the Inertial Upper Stage and integrating the complete spacecraft into the Space Shuttle. This includes development of system level end-to-end test plans. Plans also call for starting advance buy for the first Development Flight Model (DFS-1) and mission control segment. Current cost estimates were completed in Jul 82 and were based on a modified competitive approach wherein two teams are competing for the "bus" development as prime and integrating contractors with a directed sub-contractor for the payload. Two separate independent cost estimates are underway and will be completed in early CY83.

(4) (U) Program to Completion: This is a continuing program.

Program Element: #33603F — Title: MILSTAR SATCOM System

DOD Mission Area: #333, Strategic Communications — Budget Activity: #3, Strategic Programs

C. Major Milestones:

Milestones	Dates
A. Program Start	April 1981
B. Concept Validation Phase	March 1982
C. Full Scale Engineering Development Contract Award	FY 1983
D. Directed First Launch	[ ]

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 35155F
DOD Mission Area: # 242-Theater-Wide Nuclear Warfare

Title: Weapon Storage and Security System
Budget Activity: # 3 - Strategic Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	-0-	-0-	2,221	3,767	-0-	5,988

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Tactical Air Forces identified a requirement for an improved method to store nuclear weapons to enhance survivability, security and safety. This need was documented in TAF SON 303-79. The Weapon Storage and Security System (WS^3) is an FY 84 new start that satisfies this need. This system provides unmanned, underground storage of nuclear weapons in the floor of European based F-4, F-16, and F-111 aircraft shelters. Survivability, in the face of a Warsaw Pact conventional attack, is greatly enhanced by the hardening, dispersal, and masking of intelligence signatures provided by the system. Operational readiness is increased by collocating the weapons with the aircraft. With the increasing threat of terrorist attack, security is enhanced by the increase in access denial time of [ ] minimum and the greatly reduc d need to convoy weapons.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

Not Applicable.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Estimated Cost
Other Procurement:						
Funds	-0-	-0-	-0-	-0-	96,900	96,900
Quantities	0	0	0	0	239	239
Military Construction						
Funds	-0-	-0-	-0-	-0-	225,900	225,900

Program Element: # 35155F

DOD Mission Area: # 242-Theater-Wide Nuclear Warfare

Title: Weapon Storage and Security System

Budget Activity: # 3 - Strategic Programs

5. (U) RELATED ACTIVITIES: Exploratory development on the storage vault segment was conducted by Defense Nuclear Agency under PE 62713H, Project A99QAXFC-304, Weapon Storage Vault. Aircraft shelter sensors being procured under PE 27589F, Air Base Defense will be integrated into the Weapon Storage and Security System command, control, and communications (C^3) segment. The C^3 segment will also tie into the Command-Control Display Unit being developed by the Army under PE 63705A, 64718A, Facility Intrusion Detection System.

6. (U) WORK PERFORMED BY: Electronic Systems Division, Hanscom AFB, Mass. has program management responsibility for the Weapon Storage and Security System.

7. (U) Weapon Storage and Security System (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984)

A. Project Description: New start to complete development of the Weapon Storage and Security System and to procure and install 239 storage vaults at[

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Not Applicable

(2) (U) FY 1983 Program: Not Applicable

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Re est: Full scale engineering development is initiated to complete development of the vault segment, integrate command, control, and communication segment, and complete pre-production engineering tasks. Specific efforts to be accomplished are final configuration definition and design, back-up power requirement definition, test planning, and production process development.

(4) (U) Program to Completion: Development and testing will be completed in FY 1985. Production will begin in FY 1986 and installation will begin in FY 1987. Program will be completed in FY 1990.

C. (U) Major Milestones:

	Major Milestones	Date
(1)	Development start	February 1984
(2)	Development Test and Evaluation	June 1985
(3)	Initial Operational Test and Evaluation	July 1985
(4)	Production decision	October 1985
(5)	Start installation	June 1987
(6)	Initial Operational Capability	October 1988
(7)	Installation complete	September 1990

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #35158F
DoD Mission Area: #333 - Strategic Communications

Title: Satellite Data System (SDS)
Budget Activity: #3 - Strategic Programs

1. RESOURCES (PROJECT LISTING): ($ in Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	28,393	7,886	7,624	0	[	]

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Satellite Data System (SDS) is a multi-payload, communications satellite which provides reliable communications [ ] SDS provides a portion of the coverage required by the Air Force Satellite Communications System for essential command and control communications to our nuclear capable forces. It also provides a high speed link between Air Force Satellite Control Facility remote tracking stations for command and control of national space assets and [ ]

3. COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in Thousands)

RDT&E	28,393	7,886	2,614	[ ]
Missile Procurement	41,770	22,518	10,200	[ ]

RDT&E Changes

FY 84 - $5.0M increase for completion of first time integration on the Space Shuttle
FY 85 to Complete - Funds [ ]

Missile Procurement Changes

FY 84 - $15.0M increase for continued launch support for the remaining two satellites to be launched on Titan III/Agena launch vehicles
FY 85 to Complete - Funds for launch support in FY 85 and beyond [ ]

Program Element: #35158F
DoD Mission Area: #333 - Strategic Communications

Title: Satellite Data System (SDS)
Budget Activity: #3 - Strategic Programs

4. OTHER APPROPRIATION FUNDS: ($ in Thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Missile Procurement: Funds	41,750	22,318	25,223	0	[	]
Quantities	0	0	0	0		
Operations and Maintenance, Funds	11,079	11,642	15,898	0		

5. RELATED ACTIVITIES: The space segment of the Fleet Satellite Communications System was developed, procured, and launched under the Navy's Program Element, 33109N. The Air Force ground Ultra High Frequency radio terminals needed for operation with the Air Force Satellite Communications System packages on Fleet Satellite Communications and Satellite Data System satellites are funded within the Air Force Satellite Communications System Program Element, 33601F. Terminals installed in aircraft were funded in the specific weapons system/aircraft Program Element. The Air Force Satellite Control Facility network is funded under Program Element, 35110F. [ ] Space Shuttle flights for the Satellite Data System satellites are provided by the Space Launch Support Program, Program Element, 35171F. MILSTAR, a new highly jam-resistant satellite [ ] is being developed under Program Element, 33603F.

6. (U) WORK PERFORMED BY: Air Force Systems Command's Space Division, Los Angeles, CA, is responsible for the Satellite Data System. The prime contractor is Hughes Aircraft Company, El Segundo, CA. General Systems Engineering and Integration is performed by the Aerospace Corporation, El Segundo, CA.

7. (U) SATELLITE DATA SYSTEM (SINGLE PROJECT LESS THAN $10M IN FY 1984):

A. (U) Project Description: See paragraph 2

B. Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: Full scale engineering development continued on satellite F-6 with improved anti-jam capabilities for the Air Force Satellite Communications System payload and optimization for launch on the Space Shuttle. First time integration of this satellite on the Space Shuttle also continued. [ ]

Program Element: #35158F DoD Mission Area: #333 - Strategic Communications

Title: Satellite Data System (SDS) Budget Activity: #3 - Strategic Programs

[ ]and the production of the sixth satellite (F-5A) continued.

(2) FY 1983 Planned Program: Major development activity for the seventh satellite (F-6) will be complete. First time integration of F-6 on the Space Shuttle will be continued. [ ] Launch support capability for satellites F-5 and F-5A which will be launched on Titan/Agena launch vehicles will be sustained. On-orbit support of operational SDS satellites will also be sustained. [ ]

(3) FY 1984 Planned Program and Basis for FY 1984 Budget Request: [ ] First time integration of the satellite on the Space Shuttle will continue. Launch support for the satellites remaining to be launched and on-orbit support of the operational SDS satellites will continue.

(4) Program to Completion: Program Element 35158F will be [ ] SDS satellites will continue to support the Air Force Satellite Communications System by providing critical [ ]communications coverage [

C. Major Milestones:

Milestones	Date
Program Start	October 1971
System Critical Design Review	March 1974
Launch First Satellite (F-1)	[
Launch Second Satellite (F-2)	
Full Operational Capability	
Launch Third Satellite (F-3)	]
[	
	] 1/

Explanation of Milestone Changes:

1/ Two month slip due to priority being placed on the delivery of the sixth satellite on schedule. The new delivery date is still well in time for the manifested Space Shuttle launch in [ ]

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable

Budget Activity: Strategic Programs, #3
Program Element: #35158F, Satellite Data System

Test and Evaluation Data

1. Development Test and Evaluation: The development contractor for the Satellite Data System was Hughes Aircraft Company, El Segundo, California. The first satellite was launched in Initial Operational Capability was established in The first satellite (F-1) was funded entirely within the development program. The second satellite (F-2) was the first vehicle funded under the production program. The development hardware included engineering models of the communication subsystems, a structural model spacecraft (X-1) and a qualification model spacecraft (Y-1). Development tests of the communications subsystems engineering models were completed in November 1973. Structural testing was satisfactorily completed on the X-1 engineering model spacecraft in May 1975. Systems level qualification was completed in October 1975 with all critical performance specifications met or exceeded. System level qualification was designed to demonstrate design integrity and performance to specification via a series of tests including shock, acoustic, modal survey, thermal, electromagnetic interference, solar-thermal vacuum, and integrated system test. The F-1 spacecraft was acceptance tested during the The Y-1 spacecraft was a fully configured spacecraft which has been refurbished and designated as flight vehicle (F-4).

2. (U) Operational Test and Evaluation: A portion of the Satellite Data System is to be part of the Air Force Satellite Communications space segment. Classical separate Initial Operational Test and Evaluation was not conducted on the space segments since all operational objectives and requirements were fully integrated into the Development Test and Evaluation effort and were not broken out separately. Compatibility, operational characteristics, and orbit performance of payloads supporting the Air Force Satellite Communications program are scheduled to be demonstrated during the follow-on test and evaluation which is managed by the Air Force Test and Evaluation Center. Results to date are contained in Development Test and Evaluation reports (see paragraph 1 above).

3. (U) Systems Characteristics:

Characteristics	Objectives	Demonstrated
Data Rate in words per minute		
Message Bit Error Rate per ten thousand bits		
Anti-Jam Protection (decibel watt)		

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63230F | Title: Advanced Tactical Fighter Technologies
DOD Mission Area: #221 Counter Air | Budget Activity: #4 Tactical Programs

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	23,000	37,361	162,314	Continuing	N/A
2472	Advanced Tactical Fighter	0	4,300	8,361	50,814	Continuing	N/A
2878	Joint Fighter Engine	0	18,700	29,000	111,500	294,000	453,200

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Advanced Tactical Fighter (ATF) Technologies program will develop technologies and concepts and define required characteristics for the next generation tactical fighter aircraft. A new generation of fighters will be needed in the early 1990s to keep pace with threat improvements and expanding mission needs and to achieve greater efficiency in overall systems operation. Because of the long lead times necessary to develop and field new aircraft (traditionally 10-12 years) we must maintain a concerted effort to develop and mature the concepts and technologies that will be responsive to tactical needs of the 1990s.

The Advanced Tactical Fighter Technologies program includes initial development and demonstration of an advanced technology engine beginning in FY 83. This is planned as a joint Air Force/Navy effort to provide a common set of verified, advanced technology components with specific application to future fighter needs.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
TOTAL FOR PROGRAM ELEMENT	0	27,338	[illegible]3,577		Continuing	N/A

FY 1983 reduction reflects Congressional action.
FY 1984 RDT&E was decreased $11.3M due to undistributed budget reductions and further deflation adjustments directed by OSD. The impact will be a delay in demonstration engine hardware availability and a corresponding reduction in engine test hours prior to full scale development. The reduction will be about 5 percent in total test hours, but will primarily impact durability test hours by about 20 percent.

4. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) N/A

5. (U) RELATED ACTIVITIES: The Joint Fighter Engine project within the Advanced Tactical Fighter Technologies PE is a joint effort with the Navy (PE#63210N, Project #W1548). A Memorandum of Understanding is being coordinated to address a cooperative advanced fighter engine demonstrator program. An Air Force and Navy Joint Future Fighters Team meets quarterly to discuss program progress and examine areas for additional co-development efforts.

Program Element: #63230F
DOD Mission Area: #221 Counter Air

Title: Advanced Tactical Fighter Technologies
Budget Activity: #4 Tactical Programs

The Advanced Tactical Fighter Technologies program is also related to the Advanced Fighter Technology Integration (AFTI) program (PE#63245F) which will develop technical capability in integrated avionics suites, digital flight control and aerodynamic refinements to meet the needs of the next generation fighter. This program is currently modifying an F-16 with a highly integrated flight/fire control system to develop greater capability and survivability in unguided weapons delivery and air-to-air combat. This program under Project #2682 and PE#63205, Project #2506 will also provide advanced two dimensional thrust vectoring/reversing engine nozzle and integrated flight and propulsion control to demonstrate an effective short takeoff and landing capability for application to future fighters.

6. (U) WORK PERFORMED BY: Technology and concept definition studies will be managed by the Air Force Systems Command/Aeronautical Systems Division, Wright-Patterson Air Force Base, OH. Contracts for concept definition studies have not yet been awarded. The advanced engine development will be managed by the Air Force Systems Command/Wright Aeronautical Laboratories and Aeronautical Systems Division, Wright-Patterson Air Force Base, OH. Contracts for advanced engine development have not been awarded.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

Project: #2472, Advanced Tactical Fighter

The Advanced Tactical Fighter project will develop the next generation fighter aircraft design leading to a full scale development decision in FY 87 and operational capability in FY 93. The ATF will be required by the early 1990s to counter two new generations of Soviet fighters that will have energy maneuverability characteristics and fire control systems equivalent to or better than our most advanced F-15/F-16s. The increased possibility of operations in areas like Southwest Asia emphasizes the need for greater combat radius, faster deployment capability and reduced logistics support than can be achieved by current fighters.

Although FY 82 efforts were unfunded, several major aircraft corporations cooperated with the USAF in completion of preliminary analytic work to define expected threat characteristics and establish goal and threshold design parameters for advanced fighters. The FY 83 planned program includes initiation of technology and concept development studies with industry. FY 84 activity will complete the concept studies and include selection at the Milestone I decision point of approximately three concepts for further design development and validation.

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: #2878, Joint Fighter Engine

A. (U) Project Description: The advances in propulsion technology sought in the Joint Fighter Engine development will be essential to achieving the significant capability improvements needed in the next generation fighter. The Joint Fighter Engine project will develop new engine design concepts and technologies appropriate for application to both the Air Force and Navy fighter requirements. Performance and durability of the resulting hardware will be validated through a competitive prototype engine demonstration of a design suitable for transition to FSED in late FY 87.

Program Element: #63230F
DOD Mission Area: #221 Counter Air

Title: Advanced Tactical Fighter Technologies
Budget Activity: #4 Tactical Programs

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Not Applicable

(2) (U) FY 1983 Program: The engine project is a new start in FY 83 that focuses on-going laboratory efforts in turbine engine development and propulsion system integration for application to USAF and Navy advanced fighters. In FY 83, contracts will be awarded with initial tasks aimed at engine design and long lead critical component hardware procurement.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The funding request for FY 1984 will complete engine design and fabricate critical engine components to begin demonstration and validation of the advanced engine design concepts, materials, and manufacturing processes. The engine components will be demonstrated through intensive testing on partial engine rigs and further integrated on slave engine test stands. Cost estimates were based on parametric analysis of F100/F101 Derivative Fighter Engine development, past advanced development programs and FY 1982 competitive contractor estimates.

(4) (U) Program to Completion: The FY 1985-FY 1987 program will complete the competitive engine demonstrator project for transition to full scale engineering development with the Advanced Tactical Fighter airframe design. Engine systems validation will be accomplished through extensive performance, durability and operability testing of engine cores and prototype propulsion systems configured specifically for tactical fighter application. This project will result in a much more mature engine design than achieved with the F100 initial engine development program for reduced risk transition to full scale development in late FY 1987.

C. (U) Major Milestones:

Milestones	Dates
Mission Element Need Statement approved by Defense Resources Board	Nov 81
Technology and Concept Development Contract Awards	Jun 83
Milestone I (Requirement Review)	Aug 84
Milestone II (Full Scale Development Decision)	FY 87
Milestone III (Production Decision)	FY 90
Initial Operational Capability	FY 93

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63244F
DOD Mission Area: #225 - Air Warfare Support

Title: Aircraft Nonnuclear Survivability
Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	1,594	2,011	2,924	3,941	Continuing	N/A
2251	Joint Technical Coordinating Group on Aircraft Survivability (JTCG/AS) Support	1,594	1,811	1,858	1,790	Continuing	N/A
2899	Aircraft Battle Damage Repair (ABDR) Support		200	1,066	2,151	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for Air Force participation in the Joint Logistics Commanders' Joint Aircraft Survivability Program. The Naval Materiel Command and the Army Materiel Development and Readiness Command are co-sponsors and contributors to the Joint Aircraft Survivability program. The program develops standard vulnerability and survivability assessment methodology, design guidance and technology for improving the combat survivability of United States aircraft to nonnuclear threats. Additionally, this program provides the resources for the Air Force Aircraft Battle Damage Repair (ABDR) program which develops aircraft battle damage repair methodology and improved rapid repair techniques and materials.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

1,594	2,011	2,067		Continuing	N/A

In FY 1984 advanced development funding is requested to capitalize on and enhance Aircraft Battle Damage Repair efforts accomplished in exploratory development.

4. (U) OTHER APPROPRIATION FUNDS: Not applicable.

5. (U) RELATED ACTIVITIES: The Joint Aircraft Survivability program is related to complementary programs of the Navy and Army accomplished under PE 63262N (Aircraft Survivability and Vulnerability) and PE 63215A (Joint Survivability Investigation). The Aircraft Battle Damage Repair program is related to a similiar Army effort accomplished under PE 738017, Maintenance Support Activities. The program also advances survivability and aircraft battle damage repair efforts in Aerospace Flight Dynamics (PE 62201F), Aerospace Propulsion (PE 62203F), Materials (PE 62102F), Aerospace Avionics (PE 62204F), and Training and Simulation Technology (PE 62205F). Coordination of effort is through a central management office of the Joint Technical Coordinating Group on Aircraft Survivability which is manned by

an officer from each command represented on the Joint Logistics Commanders Group. Duplication is avoided through joint reviews by that office and the individual service task agencies.

6. (U) WORK PERFORMED BY: Air Force Flight Dynamics Laboratory, the Air Force Aero-Propulsion Laboratory, the Air Force Avionics Laboratory, the Air Force Aerospace Medical Research Laboratory, the Air Force Human Resources Laboratory, and the Aeronautical Systems Division. All of these organizations are at Wright-Patterson Air Force Base, OH. Major contractors are General Electric Company, Cincinnati, OH; The Boeing Company, Seattle, WA; Systems Research Laboratories, Dayton, OH; Booz Allen Applied Research, Bethesda, MD; and Georgia Institute of Technology, Research Institute, Marietta, GA. The total number of additional contractors is six and the total dollar value of these additional contracts in FY 84 is $631,000.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 2251, oint Technical Coordinating Group on Aircraft Survivability (JTCG/AS) Support. This is a level of effort project at funds the Air Force share of the Joint Logistics Commanders approved tri-service program in aircraft nonnuclear survivability. It involves: (1) the coordination of individual service programs to increase the survivability of aeronautical systems in a nonnuclear threat environment, (2) development efforts to complement the Service's survivability programs in the area of technology, assessment methodology, design criteria and specifications and standards, and (3) maintaining close liaison with other Services to ensure that all survivability R&D data and systems criteria are made available to the developers of aircraft. JTCG/AS programs have saved or avoided costs of $21.8M in FY 1982 and will yield additional cost avoidances of $15.7M through FY 1988. Major accomplishments resulting in this savings include: (1) development of a filiment wound survivable external fuel tank, (2) development of a foreign warhead threat model, (3) development of a survivability assessment model which was used by Aeronautical Systems Division on the Air Launched Cruise Missile, B-1, and F-16 programs, (4) validation of the Halon fire protection system for F/A-18, and (5) development of a more survivable seat for the Army UH-60A helicopter. In FY 1983 the JTCG/AS is funding and closely monitoring 74 separate survivability tasks, 24 of which are being performed by the Air Force. Principal goals for FY 1983 are to: complete the multiplexed electronic countermeasures/radar system study, complete Phase II of the turbine engine infrared signature reduction concept development, and complete initial assessment of electro-optical countermeasures capability to enhance aircraft survivability against electro-optical tracking devices used on low and medium altitude air defense threat weapons systems. Additionally, the project will continue radar cross section technology requirements analysis; continue development of a capability to include biotechnology issues in survivability assessments; update, document, and disseminate a standard family of surface-to-air missile (SAM) models; initiate development of a surface-to-air laser threat model; and analyze the survivability of electric flight control actuation systems. In 1984 the following major activities are planned: continue development of the surface-to-air laser threat model, continue analysis of radar cross section technology requirements, conduct survivability testing on electric flight control actuation systems, and develop ballistic tolerant integral composite construction concepts.

Program Element: #63244F
DOD Mission Area: #225 - Air Warfare Support

Title: Aircraft Nonnuclear Survivability
Budget Activity: #4 - Tactical Programs

B. Project: 2899, Aircraft Battle Damage Repair (ABDR) Support. In an intense combat environment a significant number of aircraft will return with battle damage that will preclude their use until repaired. It will be essential that repairs be made and the aircraft returned to operational use as soon as possible if they are to contribute to the outcome of the combat situation. The purpose of this project is to provide enhanced and proven techniques, procedures and design standards to rapidly assess and defer/repair battle damaged aircraft in an intense combat environment. The project extends the existing aircraft battle damage repair capability to be able to rapidly assess and repair advanced structures, flight control systems, and other flight critical aspects of current and emerging aircraft (F-15, F-16, A-10, etc.). The project also provides design guides and standards, and a resource qualification methodology that can be applied to advanced aircraft such as the Advanced Tactical Fighter (ATF) to increase battle damage tolerance, repair deferability, ease of assessment and repair, and validly quantify ABDR resources. This effort includes the collection, storage, dissemination and analysis of data to support the project and identify opportunities for technology application. In FY 1982, Phase I of the combat damage repair time methodology was completed. In FY 1983 Phase II of the repair time methodology development will be initiated; a self-repairing flight control system design concept study will be performed, combat damage data will be collected, and a combat damage repairability/deferrability trade study will be performed to select battle damage critical systems which contribute to combat sortie degradation. The study will be used in development of rapid repair technologies and battle damage tolerant guidelines. In 1984 major efforts planned are: development of an automated decision aid for battle damage repair assessment, development of rapid repair technology, and base level simulation of battle damage on aircraft and components. Continue development of combat damage repair time analysis methodology. Develop ABDR resource quantification methodology and upgrade the Combat Data Information Center capability to include an expanded ABDR data base.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63249F
DoD Mission Area: #223, Close Air Support/Interdiction

Title: Night Attack Program
Budget Acitivity: #4, Tactical Program

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	7,017	4,491	3,748			43,549
2628	MMW	3,088	491	0			9,061
2882	Target Recognizer Technology for LANTIRN	2,029	4,000	3,748			32,588
2910	F/A-18 FLIR Pod Evaluation	1,900					1,900

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION: The specific Air Force needs for an improved night air-to-surface attack capability are documented in the Statement of Operational Need (TAF SON) 302-81 dated 11 Mar 81. To achieve the goal of multiple kills per pass, a capability for rapid target recognition is needed. The Target Recognizer Technology is complementary to the Low Altitude Navigation and Targeting Infrared System for Night (LANTIRN) system which is in full-scale development and is designed to provide that capability of multiple kills per pass when integrated into the LANTIRN targeting pod.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total
RDT&E	3,088	4,491	3,912		35,800	77,972

(U) EXPLANATION OF CHANGES: The total program funding has been adjusted to reflect only that portion of the target recognizer technology which will be in advanced development. FY 82 funding for project 2910 established in response to Public Law 97-252.

4. (U) OTHER APPPROPRIATION FUNDS: Not Applicable

5. (U) RELATED ACTIVITIES: The LANTIRN targeting pod being developed under PE 64249F is designed to accommodate a target recognizer for automatically acquiring targets. Based on the degree of demonstrated performance in advanced development, integration of the recognizer into the targeting pod could provide a significant increase in expected kills per pass.

6. (U) WORK PERFORMED BY: This effort will be managed by the Aeronautical Systems Division, Wright-Patterson AFB, OH and performed by two competing contractors. These contractors are Martin Marietta Corp, Orlando FL, and Hughes Aircraft, Canoga Park, CA. Advanced Target Recognizer studies are being managed by the Avionics Laboratory, Aeronautical Systems Division, Wright-Patterson AFB, OH.

Program Element: #63249F

DoD Mission Area: Close Air Support/Interdiction, #223

Title: Night Attack Program

Budget Activity: Tactical Programs, #4

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

(U) Project: 2882, Target Recognizer Technology for LANTIRN

A. (U) Project Description: The FY 1984 Target Recognizer Technology will culminate the advanced development efforts using contractor laboratory processors to demonstrate maturity of software algorithms and proposed microprocessor hardware. The advanced development is being accomplished through level-of-effort contracts with two competing contractors. Funding will also provide high quality FLIR data for evaluating performance of these two recognizers as well as other target recognizers which may be available at that time.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Successfully completed target recognizer breadboard (laboratory) processor and contractor demonstrations with limited sample data base. Program for obtaining expensive, high quality data base to be used in future evaluation was initiated. Millimeter radar/pod integration was completed and testing of pod on T-39 testbed was begun.

(2) (U) FY 1983 Program: Digital FLIR data will be collected and provided to each contractor for more accurate assessment of recognizer performance. Testing of millimeter radar will be completed.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The FY 84 funding request will complete advanced development activities for competing target recognizer technologies. Competing recognizers will be evaluated based on target recognition performance using high quality standard FLIR input data. Cost estimate based on level of effort to be accomplished under existing contract.

(4) (U) Program to Completion: If technology demonstrated to be sufficiently mature, program will be transitioned to full-scale development under PE 64249F.

C. (U) Major Milestones:

Milestones	Dates
(1) Obtain digital FLIR for data base	Jan 1983
(2) Conduct performance evaluation of competing recognizers	Jan 1984
(3) Transition to full-scale development	TBD

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63256F
DOD Mission Area: # 225, Air Warfare Support

Title: Joint Services Advanced Vertical Lift Aircraft (JVX)
Budget Activity: #4 Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
2971	JVX Airframe Development	0	0	14,351	42,926	547,123	604,400
2972	Modern Technology Engine (MTE) Development	0	0	0	0	235,700	235,700

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The JVX will provide the Army, Navy, Air Force and Marine Corps with the ability to conduct combat, combat support and combat service support missions requiring vertical takeoff and landing capabilities. JVX will replace a number of aging, obsolescent aircraft not adequately capable of performing the assigned mission and will also provide for expanded mission capabilities. In the 1990's and beyond, the JVX will be a primary replacement for the Air Force Special Operations Force (SOF) HH-53/CH-53 helicopter and will supplement the capability of the MC-130E/H aircraft. JVX will provide a new, additive capability for special operations and combat rescue forces.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands) N/A

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Aircraft Procurement, Air Force:						
Funds (current requirements)	$0	$0	$0	$0	TBD	TBD
Quantities (current requirements)	0	0	0	0	200	200

5. (U) RELATED ACTIVITIES: N/A

6. (U) WORK PERFORMED BY: Two contractors will be competitively selected to perform preliminary design of the JVX. The contractors will be selected in early CY 83. The principal RDT&E agency will be Naval Air Systems Command (NAVAIRSYSCOM). Numerous agencies from the Joint Services will participate.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: None are anticipated at this time.

Program Element: # 63256F
DOD Mission Area: # 225, Air Warfare Support

Title: Joint Services Advanced Vertical Lift Aircraft (JVX)
Budget Activity: # 4 Tactical Programs

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

A. (U) Project Description: JVX is expected to reduce Department of Defense costs through execution of a joint development program for a common aircraft. The JVX is a joint Army, Navy, Air Force, Marine Corps program with the Navy as Executive Service in accordance with the joint Memorandum of Understanding dated 4 Jun 82, the Secretary of Defense Decision Memorandum of 8 Dec 82, and the USDR&E Memorandum of 27 Dec 82. The JVX will be an advanced technology vertical lift aircraft capable of meeting multimission service requirements, while achieving a significant increase in performance over current aircraft. We currently view the JVX as a supplement to the capability of Special Operations Forces (SOF) MC-130, as a replacement for the SOF HH-53, and as a complement to the combat rescue vertical lift fleet. In the mid-1990s, we plan to incorporate the HH-60D avionics suite into the Air Force version of the JVX. A mixed fleet of HH-60D and JVX aircraft will combine the helicopter's efficiency in the low level, slow speed, nap-of-the-earth flight regime with the high speed and long range of the tilt rotor to achieve the full spectrum of capability required to perform the worldwide combat rescue/special operations mission - a capability neither aircraft alone can provide.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Using funds provided by each of the Services, a Joint Services Operational Requirement was staffed, a Joint Technology assessment was conducted, a Joint Services Memorandum of Understanding signed, and a RFP was prepared for release to industry. JVX is an FY 83 (not FY 82) new start.

(2) (U) FY 1983 Program: OSD reviewed the acquisition strategy on 15 November 1982 and approved release of the competitive Request for Proposal to industry for the preliminary design phase. The Request for Proposal was released to industry 17 January 1983. Proposals will be evaluated to support selection of two competitors who will conduct a series of wind tunnel tests, construct mock-ups, develop math models to be used to simulate JVX on the National Aeronautics and Space Administration (NASA) Vertical Motion Simulator, conduct trade studies to identify the cost and weight drivers of JVX, and make cost estimates for the program.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The JVX preliminary design effort started in FY 83 will continue in FY 84 with the addition of contractural effort in start-up of limited detail design, and prototype producibility engineering to prepare for entering Full Scale Development in FY 85. During this phase, industry will develop the JVX design, conduct extensive wind tunnel tests, simulations, and complete a proposal for the balance of the program. The purpose of this 23 month effort is to clearly define the cost, risks, and schedule before continuing with the major portion of the program.

(4) (U) Program to Completion: Full Scale Engineering Development and Testing of eight (8) prototype air vehicles. Emphasis will be placed on verifying actual system performance through joint and integrated test and evaluation performed in compliance with DOD directive 5000.3. Air Force peculiar test and evaluation (FSD/OT&E) will be combined contractor/government technical test. JVX Production Release begins in FY 89 for the Marine Corps. Production Release for the Army, Navy and Air Force is in FY 91 leading to Air Force Special Operations Force IOC in FY 93 and Search and Rescue IOC in FY 1995. Production of 200 aircraft for the Air Force will be completed in FY 2000.

Program Element: #63256F

DOD Mission Area: # 225, Air Warfare Support

Title: Joint Services Advanced Vertical Lift Aircraft (JVX)

Budget Activity: #4 Tactical Programs

C. (U) Major Milestones:

Milestones	Dates
1. Preliminary Design Contract Award	2 Q FY 83
2. Full Scale Development Contract Award	3 Q FY 85
3. Long Lead Release	3 Q FY 87
4. OT&E (USMC)	2 Q FY 88
5. Full Production Release	1 Q FY 94
6. First USMC Delivery	3 Q FY 91
7. USA/USAF/USN Delivery	1 Q FY 93

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63307F
DOD Mission Area: #214-Ground Based Anti-Air and Tactical Missile Defense

Title: Air Base Survivability (ABS)
Budget Activity: #4-Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	Air Base Survivability (New Start)	0	0	3,832	3,310	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The ability of USAF elements to sustain combat aircraft sortie generation capabilities under actual or threat of conventional air attack, chemical attack and or open/covert ground attack against airbases must be guaranteed. The purpose of this new start program is to initiate technology improvements for Air Force Base Survivability (ABS) program. Efforts will focus on integrating operations concepts, planning, research, development and acquisition programs to provide sustained combat sortie generation capabilities when hostilities occur on or in proximity to theater air bases.

Validated requirements for the development of improvements to ABS include TAF SON 319-79, Post Attack Launch and Recovery, TAF ROC 318-75, All Purpose Chemical/Biological Agent Decontaminant, and TAF ROC 318-75, Collective Chemical/Biological Protection Equipment. Prior efforts to satisfy these requirements were fragmented along functional lines. This program recognizes the interdependence of the diverse efforts which make up ABS. These include active defense, passive defensive measures, base recovery, survivable base and intra-theater C^3 and improved aircraft landing and takeoff performance.

The program provides for an effective ABS system by applying a program management approach to the planning, integration, and control of ABS technology. A comprehensive, worldwide ABS master plan and Investment Strategy will be developed to cover operational concepts, research, training, development, acquisition, manpower and support. Initial planning will emphasize improving near term capabilities.

3. (U) COMPARISON WITH FY 83 DESCRIPTIVE SUMMARY: ($ in Thousands)

This is a new start program for FY 1984 with no prior Descriptive Summary.

Program Element: #63307F
DOD Mission Area: #214-Ground Based Anti-Air and Tactical Missile Defense

Title: Air Base Survivability (ABS)
Budget Activity: #4-Tactical Programs

4. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) N/A

5. (U) *RELATED ACTIVITIES:*

This is a new start program for FY 1984. A new 64307 Program Element was recently created to provide an orderly transition of 63307F efforts into full scale development.

6. (U) WORK PERFORMED BY:

This is a new start program in FY 1984. In-house development organizations responsible for elements of the program are Armament Division and Aeronautical Systems Division (Air Force Systems Command).

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

Project: Air Base Survivability (single project in program element)

This is a new start program in FY 1984. The purpose of this new start is to provide a single program to focus use of promising technologies directly on advanced development items needed to meet valid ABS requirements. As many separate equipments and items are needed, this single program will provide centralized management of the advanced development work needed including tradeoff studies, investment strategy, master planning, as well as individual item advanced development, e.g., Ordnance Rapid Area Clearance System (ORACLE), Measure of Merit Modeling, Airborne Damage Assessment System, Mobile Weapon System, Rapid Runway Repair Techniques, etc.

Additional details on specifically planned efforts include: continuing operation of the System Management Office at Armament Division (Air Force Systems Command); Measure of Merit Analysis to quantify the contributions to combat sortie generation of all ABS investments; recording of a comprehensive data base for all ABS efforts; master planning and investment strategy planning responsive to changing needs, technology and operational and system concepts; planning for interoperability with allies; evaluation of missions, current capabilities, improvement alternatives, and prioritization processes; cost effectiveness analyses; maintaining comprehensive base vulnerability and trend analyses; coordinating activities with development and using commands; supporting operating commands and Air Training Command to define required training courses, objectives, and equipment; programming and sponsoring demonstrations/validations of candidate ABS systems; participating in exercise planning; and conducting integration studies in coordination with Air Staff and Major Commands/Separate Operating Activities.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63714F
DoD Mission Area: #225 - Air Warfare Support

Title: DoD Physical Security Equipment-Exterior (Adv Dev)
Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	996	3,911	3,715	1,913	3,900	51,700

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports the development of the Department of Defense Base and Installation Security System, a standardized exterior physical security system, by accomplishing advanced development tasks in three functional areas: detection, command and control, and imaging. A Department of Defense need exists for a family of standardized modular equipment, integrable into system configurations to provide a level of security in consonance with the deployment mode, threat level, and sensitivity of the asset being protected. The resulting security equipment increases the capability of the security forces to detect and intercept terrorists and permits increased mobility of the forces for better utilization of existing manpower.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	996	3,911	3,838		4,500	51,100
Procurement (Other)(27589F) (formerly 27596F)	10,789	21,820	70,953		Continuing	Not Applicable

The decrease in FY 1984 procurement funding is due to a slip in the full-scale development of the mobile individual resource protection sensor which slipped procurement funding requirements to FY 1985.

4. (U) OTHER APPROPRIATION FUNDS:

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Procurement (Other)(27589F) (formerly 27596F)	10,860	20,424	8,806	83,498	Continuing	Not Applicable

Program Element: #63714F
DoD Mission Area: #255 - Air Warfare Support

Title: DoD Physical Security Equipment-Exterior (Adv Dev)
Budget Activity: #4 - Tactical Programs

5. (U) RELATED ACTIVITIES: Full-scale development of equipment, subsystem/system integration and test, and type C (production) specification development is accomplished under Program Element 64715F, Department of Defense Physical Security Equipment-Exterior (Engineering Development). Procurement of physical security equipment is accomplished using Other Procurement-Air Force funding under Program Element 27589F, Base Physical Security Systems. The Base and Installation Security System equipment will be designed for interoperability with the Army interior security system (Facility Intrusion Detection System) and the Army tactical sensor system (Remotely Monitored Battlefield Sensor System). This program also interfaces with an exploratory development program for nuclear site security managed by the Defense Nuclear Agency. Management oversight of the physical security equipment programs is provided by the Department of Defense Physical Security Equipment Action Group with the Chairperson residing in the Office of the Under Secretary of Defense for Research and Engineering.

6. (U) WORK PERFORMED BY: This program is managed by the Physical Security Systems Directorate, Electronic Systems Division, Hanscom Air Force Base, MA. Department of Defense agencies performing development tasks are: Rome Air Development Center, Griffiss Air Force Base, NY; Army Mobility Equipment Research and Development Command and Army Night Vision Laboratory, Fort Belvoir, VA; Army Waterways Experimental Station, Vicksburg, MS; Naval Ocean Systems Center, San Diego, CA; and the Naval Coastal Systems Center, Panama City, FL. In addition to these Defense agencies, the Department of Energy/Sandia Laboratories, Albuquerque, NM, performs advanced development tasks and the Analytical Systems Engineering Corporation assists in the system engineering support and integration task.

7. (U) DoD Physical Security Equipment-Exterior (Adv Dev) (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984)

A. (U) Project Description: This program responds to Secretary of Defense direction contained in Department of Defense Directive 3224.3, 1 December 1976, which designates the Air Force as executive agency for the development of standardized exterior physical security equipment and systems for protection of bases and installations. A world-wide increase in the level of terrorist threat and a greater emphasis on security protection for mission-critical resources necessitate the development of a standardized system capability for use by all Defense agencies. The objectives are to provide a capability for high level security, against all threat levels, for resources in three deployment modes: permanent, semipermanent, and mobile. This program provides a technology base, accomplishes advanced development tasks, and develops prototype equipment for full-scale development. Maximum utilization is being made of technology and prototypes developed by other Services and commercial sources whenever feasible.

Program Element #63714F
DoD Mission Area: #225 - Air Warfare Support

Title: DoD Physical Security Equipment-Exterior (Adv Dev)
Budget Activity: #4 - Tactical Programs

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Many advanced development tasks have been accomplished with the following subsystem components having completed advanced development in FY 1982: ported coaxial cable sensor and mobile individual resource protection sensor.

(2) (U) FY 1983 Program: Advanced development continues in the following areas: pyroelectric vidicon imaging sensor, advanced signal processing techniques, sensor data acquisition, and foliage penetration radar.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Includes funds for the continued advanced development of technologies and prototype equipment for the Total Base and Installation Security System capability. Primary emphasis will be placed on sensor data acquisition and aerial intrusion detection techniques. Sensor data acquisition techniques will provide better utilization of existing sensor outputs by providing combinational and central processing to reduce nuisance alarms and improve the probability of detection. Aerial intrusion detection techniques are being developed to provide a detection capability for intrusions into nuclear storage areas by helicopter, parachute, and/or hang glider. Cost estimates are based on inputs from various government agencies performing these development efforts which were updated in September 1982.

(4) (U) Program To Completion: This program will provide technology and prototype equipment for engineering development of the Base and Installation Security System. Advanced development tasks will continue at a nominal level subsequent to the availability of the Total Base and Installation Security System capability to keep the system current with the state-of-the-art technology.

C. (U) Major Milestones: Not Applicable

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63718F Title: Electronic Warfare Technology
DOD Mission Area: 374 - Multimission, Technology, & Support Budget Activity: 4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	11,156	13,350	24,736	26,349	Continuing	Not Applicable
691X	Electronic Warfare Technology	8,000	6,125	14,536	16,949	Continuing	Not Applicable
2432	Warning and Power Management Systems Technology	3,156	4,925	8,100	7,700	Continuing	Not Applicable
2754	C^3 Countermeasures Technology	0	2,300	2,100	1,700	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides advanced development in the area of electronic warfare where an expanded technology base is needed to solve critical penetration aid problems for all classes of manned and unmanned aircraft. This program also provides for component, technique and subsystems development leading to the reduction of acquisition and life cycle cost of electronic warfare equipment and systems.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
RDT&E	11,756	18,724	21,087		Continuing	Not Applicable

(U) The decrease in funding in FY 82 reflects reprogramming of funds out of the PE to fund another higher priority program. The decrease in funding in FY 83 reflects a congressionally directed reduction with no rationale provided and a reprogramming of funds out of the PE to fund another higher priority program. The increase in funding in FY 84 is the net result of a share of congressionally directed undistributed reductions, inflation adjustments, and the addition of funds to support the OSD Reliability and Maintainability Initiative. These funds will be used to find techniques to significantly improve the reliability and maintainability of electrionc components and systems in Electronic Warfare equipment.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

5. RELATED ACTIVITIES: The efforts in this program are closely coordinated with Program Element (PE) 63743F, Electro-Optical Warfare and other electro-optical and electronic warfare programs as well as advanced development work in similar activities by the Army and the Navy through joint reviews conducted by the Joint Technical Coordinating Group and memoranda of agreement. Exploratory development efforts are phased into this program from PE 62204F, Aerospace

Program Element: 63718F Title: Electronic Warfare Programs
DOD Mission Area: 374 - Multimission, Technology, & Support Budget Activity: 4 - Tactical Programs

Avionics. Completed electronic warfare efforts are transitioned into the engineering development programs: PE 64220F, EW Counter Response; PE 64710F, Reconnaissance Equipment; PE 64724F, Tactical C^3 Countermeasures; PE 64738F, Protective Systems; PE 64737F, Airborne Self Protection Jammer; and PE 64739F, Tactical Protective Systems. Tri-Service efforts are in [ ] radar warning receivers and jamming systems and [ ] countermeasures. Joint Air Force/ Navy efforts are in an Advanced Transmitter applicable to the ALQ-99 installed in the EF-111A, EA-6B, and expendable countermeasure decoys. It is expected that a joint program with the Navy will be established in the Integrated Electronic Warfare System (INEWS) formerly the New Threat Warning System (NTWS). Project 2754 is new in FY 1983. It continues efforts previously funded in Project 691X and initiates new efforts developing C^3 countermeasures technology. Advanced planning, architecture, and overall guidance will be performed in PE 63749F, C^3 Countermeasures Advanced Systems, Project 2947, Advanced C^3 Countermeasures.

6. (U) WORK PERFORMED BY: The Air Force Avionics Laboratory, Wright-Patterson Air Force Base, OH, manages the program Development Center, Griffiss AFB, NY. The major contractors are: CALSPAN, Buffalo, NY (691X); Georgia Technology Research Institute, Atlanta, GA (691X); SEDCO Corporation, Farmingdale, NY (691X); GTE Sylvania Corporation, Mountain View, CA (691X, 2754); and RAYTHEON, Goleta, CA (691X, 2432). There are eight additional active contractors with a total contract face value of $3,708.8 thousand.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: 2432, Warning and Power Management Systems and Technology

The purpose of Project 2432 is to develop warning and power management technologies to cope with the projected threat environments both for strategic and tactical aircraft. The project includes the following areas: 1) advanced power management systems to develop and evaluate optimum system configurations, 2) high speed, flexible jamming signal generators, 3) radar signal receiver technologies that are smaller, can handle dense signal environments, and are able to detect exotic threat signal modulations, 4) high speed signal processors that can sort through data and determine optimum jamming response, and 5) receive and transmit antennas which can provide precise threat direction and unambiguous warning to aircrews. The enemy air defense network relies on radar systems to search, acquire, target, and guide missiles and antiaircraft fire. Because of this proliferation of different radar systems in large numbers, and over a large portion of the microwave frequencies, sophisticated systems are required to analyze the threat environment and either warn aircrew of potential threats or initiate an automatic jamming response. Literally, millions of radar pulses will impinge on the aircraft and require extensive sorting to determine the [ ] This project is a technology base effort. User requirements are documented in TAF SONs 304-80, 315-73, and SAC ROC 3-79. FY 1982 accomplishments include the testing and demonstration of the Advanced Power Management System (APMS) against a modern threat environment simulated by the Avionics Laboratory's High Density Environment Simulator (HIDES) and Dense Electromagnetic Environment Simulator (DEES). The dense environments included emitter signals exhibiting [ ] The Integrated Electronic Warfare System (INEWS) program was initiated jointly with the Aeronautical Systems Division to develop the core offensive/defensive EW suite for advanced 1990 aircraft with primary attention given to the Advanced Tactical Fighter (ATF). Phase 0, New Threat Warning System Concept Definition Studies, was completed. A preliminary NTWS System Specification was completed and distributed to DOD agencies and industry for review and comment. In FY 1983, the APMS will be tested and demonstrated with improved [ ] receiver capablity and advanced radar [

capabilities. Phase 1 of the NTWS programs initiated in FY 1983 to demonstrate technology and system integrity. This will lead to a brassboard demonstration of competing technologies prior to beginning engineering development designs (Phase 2). In FY 1984, evaluation of the Modified Advanced Power Management System with new subsystems will continue, along with development of new threat signal processor, storage devices, and EW antenna designs. The INEWS will continue demonstrating critical warning technology subsystems.

B. Project: 2754, C^3 Countermeasures Technology

The purpose of this new project is to consolidate communication, command and control countermeasures (C^3CM) efforts previously conducted in Project 691X and new efforts designed to develop and demonstrate counters to enemy C^3 systems. Major thrusts include: Airborne jamming and deception techniques; drone-borne and expendable C^3CM; analysis, simulator and evaluation support; location and identification of C^3 nodes and links; and ground based voice and signal deception. In order to accomplish their assigned missions and improve aircraft survivability, the TAF, SAC and ESC require a combined air and ground capability to degrade selected enemy communication links and nets. Included are methods to identify critical enemy communications links, integrate this information into the signals intelligence network, and display the enemy battlefield communication scenario. These countermeasures enable tactical and strategic aircraft to The Tactical C^3 jammer modules for use on mini-drone vehicles completed risk reduction work in FY 1982. The C^3 jammer brassboard system will be completed in FY 1984. Simulator testing will be conducted to determine expected effectiveness in a suitably dense signal environment characteristic of actual combat. A mini-drone jammer will be developed in FY 1983 and targeted against A technology demonstration will also be conducted in FY 1983 via flight tests against complexes at Nellis AFB flight test ranges. A new start development effort will be initiated in FY 1983 for a software and display capability to Algorithm definition and design will be completed and the system will be configured in FY 1984. In addition, the C^3 jammer pod modules will be test flown. The processing/display capabilities for realtime C^3 target recognition and location and ground based voice deception efforts will be started in FY 1984. Drone-borne C^3 jammers will be flight tested and transitioned to full scale engineering development. This is a technology base program which supports TAF GOR 301-78, ESC SONs 1-80 and 3-80, and SAC ROC 23-69.

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: 691X, Electronic Warfare Technology

A. (U) Project Description:

(U) The purpose of Project 691X is to provide advanced development of new countermeasure techniques and hardware for both existing and new electronic warfare systems. The project includes the following areas: (1) a supporting simulation effort that guides the allocation of funding through the evaluation of new concepts and techniques; (2) radar signature reduction to delay and impair acquisition and tracking of our aircraft by enemy radar; (3) on-board jamming systems, components, and techniques needed to jam enemy radar; (4) off-board or expendable systems to confuse enemy radars and dilute enemy defenses; (5) electronic collection systems to inform the field commander of changes in the electronic environment; and (6) the development of standardized and low cost reliable and maintainable components and

Element: 63718F Title: Electronic Warfare Technology
DOD Mission Area: 374 - Multimission, Technology, & Support Budget Activity: 4 - Tactical Programs

systems to enable the Department of Defense to better afford the increasing amount and sophistication of electronic countermeasures equipment require on modern aircraft. The enemy air defense network is characterized by both airborne and land based radar and communication systems that locate, monitor, guide, and control offensive and defensive elements. The enemy continues to improve these elements against our forces and our operational countermeasures. This requires a strong technology base to provide demonstrated counters to these improvements and avoid technological surprises by new enemy threat systems. This project is a technology base effort which supports TAC SONs 315-73, 301-78, and 304-80; SAC SONs 23-69, 13-73, 3-79, 6-81, and 10-81; and MAC SONs 7-81, 8-81, and 9-81.

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: The countermeasure was successfully flight tested against ground-based and airborne systems and demonstrated breaklock capability. The Advanced High Power Transmitter system was delivered and installed on a Navy A-3 aircraft and underwent safety-of-flight testing in preparation for countermeasure evaluation in FY 1983. The Extra-High Frequency (EHF) EW system was completed and shipped to the Naval Air Test Center for ground testing. Testing will continue in FY 1983. Development of the advanced EHF Transmitter subsystem was completed. This transmitter will upgrade the EHF EW System, which is a joint program with the Navy. measurements for a aircraft design were made at the RATSCAT facility at Holloman AFB, NM. The results will be analyzed to determine the countermeasure implications of Selected risk reduction efforts to support the C^3 jammer (such as compressive receiver application) were completed and development of the C^3 jammer was initiated (this work will be transferred to Project 2754 in FY 1983). The advanced mixed mode deception system has been evaluated at the REDCAP facility and demonstrated a countermeasure capability. ECM testing was successfully completed against the SADS IV system. A capability was demonstrated against in general. As a result of the reduction of the FY 1982 funding, the Metallized Radome, and the efforts had to be deferred until FY 1983. The High Temperature Radar Absorbing Material effort to was cancelled. Important technology will be delayed in development thus delaying transition and fielding critically needed protection to operational forces.

(2) FY 1983 Program: The Fuze Countermeasure Brassboard system will be completed and ready for testing against a fuze model comparable to the type that would be used against a cruise missile target. Development effort will start on a metallized radome and special jamming array technology for application to low cross section aircraft. The metallized radome is specifically intended for the chaff development will be started and will address the problem of generating a signature. Chaff that opens rapidly and presents a signature is required for confusion and track break of weapons. The advanced transmitter system will undergo flight test evaluation against , and the enhancement that will be afforded the The Low Band Advanced Transmitter development will be initiated and will also be designed for the system. The ground testing of the EHF EW system will be completed at NATC. The Advanced EHF Transmitter Subsystem development will continue and use of this transmitter in a flight test program in FY 1984/1985 is planned. Support of the C^3 jammer system will be continued. A program to support engineering development of the countermeasure for application will be started to provide the needed data base of terrain reflectivity data. Countermeasure analysis of the hostile signal environment will be supported by initiation of an signal processor design. This will provide capability for signal

Program Element: 63718F   Title: Electronic Warfare Technology
DOD Mission Area: 374 - Multimission, Technology, & Support   Budget Activity: 4 - Tactical Programs

(3) FY 1984 Program and Basis for FY 1984 RDT&E Request: The Fuze Countermeasures Brassboard will be field tested at either the Naval Weapons Center, China Lake or Holloman AFB, NM. The system is being designed to aid a Therefore, this jammer is intended for The metallized radome being designed for the will be completed and radar cross section measurements taken of the radome itself and mounted on an, This program does not include flight testing. The Special Jamming Array investigation of will continue. This effort seeks to make high gain, high performance ECM antennas compatible with aircraft. The Chaff Program will continue development of fabrication and packaging techniques and the enhancement of the chaff's signature. The C^3 Jammer Program will complete the brassboard system. The brassboard will be evaluated in FY 1985 at the REDCAP Facility and funded by Project 2754. The Advanced EHF Transmitter subsystem fabrication will be completed and initial flight test preparations will be started. Tests against the radar are planned and a joint US/UK test with the radar is also planned. The Terrain Measurements program will complete instrumentation work and preparation for the airborne test platforms. Initial field measurements in support of the engineering development of the countermeasure will begin. The Low Band Advanced Transmitter development for the will be continued. New starts in FY 1984 include a 48 month High Power Technology Risk Reduction program to demonstrate that a system based on use of can be installed and flown on an aircraft. This is the key element in an airborne application of radio frequency technology. A possible joint program with the Navy may be pursued if this technology can be used on a ship. A 42 month program to apply new concepts to the countermeasure against a will be started. This program will advance the technology required to shorten the application to tactical aircraft. In addition, a 36 month study will develop design concepts to enable the technique to operate effectively against A 48 month new start effort to demonstrate countermeasure concepts to degrade the second generation will be undertaken. This effort will be a follow-on to the PE 62204F/Project 2000 Countermeasures investigations A 24 month program to demonstrate the technology approach required for and the capabilities of processing will be initiated. This demonstration effort is based on analysis of radar signal information obtained from both The design for the processor will be provided from an ongoing development program. is needed to enable of the threat signal environment and to handle the emitters that are difficult to process. Several new start efforts will be initiated to specifically address reliability and maintainability issues associated with EW equipment and systems. Examples includes Travelling Wave Tubes, RF Amplifier Chains, EW power sources, and receiver channel reliability. The programs scheduled for completion or planned for continuation will require approximately $17,945 thousand. Approximately $6,782 thousand will be available for new starts and $960 thousand will be needed for in-house laboratory support. Estimates for the new starts are based on industry feedback and engineering feedback.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63726F
DOD Mission Area: #551, Electronics and Physical Sciences

TITLE: Fiber Optics Development
Budget Activity: #2, Advanced Technology Development

1. (U) RESOURCES: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
TOTAL FOR PROGRAM ELEMENT (RDT&E)	--	2,864	2,775	3,481	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Air Force Fiber Optics Development Program provides for the development of fiber optic systems needed to meet Air Force operational requirements for lightweight, low cost, broadband transmission systems. Also included is the development of standards to provide interoperability between Air Force systems and the systems of the other Services and to prevent the proliferation of non-standard equipments.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
TOTAL FOR PROGRAM ELEMENT	--	2,864	1,660		Continuing	Not Applicable

FY 1984 shows an increase which was the result of Air Force identification of additional tasks which can be accomplished with fiber optics. The increase was fully justified on the basis of significant cost savings (over the use of conventional systems such as coax cable and copper wire) along with the other advantages offered by the employment of fiber optics in USAF systems.

4. (U) OTHER APPROPRIATION FUNDS: N/A

5. (U) RELATED ACTIVITIES: The Air Force Fiber Optics Program is funded by two program elements (63726F for RDT&E dollars for Advanced Developmental efforts, and 27586F for procurement dollars for follow-on acquisition and near term acquisition. 27586F also contains required manpower for this program). Most Advanced Developmental efforts follow the Basic Developmental efforts previously began under PE62702 (TECH BASE). Of note, also, was the development by the Rome Air Development Center of a radio remoting system for an Air Support Operations Center. This effort was begun in FY 1982 and funded by the Productivity, Reliability, Availability and Maintainability (PRAM) office at Wright-Patterson Air Force Base. The system was successfully demonstrated at Bergstrom Air Force Base, Texas.

The Tri-Service Fiber Optics Steering Committee (Chartered by OSD) coordinates all DoD fiber optic activities for components, standards and system development. Membership consists of Air Force, Army, and Navy representitives. This organization assures intergrated nonduplicative programs.

Program Element: #63726F TITLE: Fiber Optics Development
DOD Mission Area: #551, Electronics and Physical Sciences Budget Activity: #2, Advanced Technology Development

6. (U) WORK PERFORMED BY: The Rome Air Development Center of the the Air Force Systems Command manages the Advanced Developmental Activities under this program with Support from the Air Force Logistics Command and Air Force Communications Command.

7. (U) FIBER OPTICS DEVELOPMENT: (Single project less than $10 million in FY 1984)

A. (U) Project Description: Provides development of fiber optic replacement for existing large tactical communications cable systems to save dollars and reduce weight and size (and save on airlift requirements). Also provides standards development and introduction of these standards into developmental systems. Specific project includes the replacement of the standard 26-pair communications cable and development of a standard family of transmitters and receivers.

B. (U) Program Accomplishments and Future Efforts:

1. (U) FY 1982 Accomplishments: The 26-pair communications cable replacement program began using Army funding through a Memo of Agreement (approx $1.2M). Other planning efforts began in preparation for the FY 83 program.

2. (U) FY 1983 Program: The program began officially with the continuation of the 26-pair cable replacement program, (funding using USAF dollars). A contract to develop a standard family of transmitters and receivers is expected to be awarded in early 1983. Finally, a developmental effort for a single fiber optical communication system will begin.

3. (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Includes continuation of Advanced Developmental activities which began in the FY 1983 program. The single fiber optical communication system will be completed in FY 84, and the 26-pair cable program and standard transceiver development will continue into FY 1985.

4. (U) Program to Completion: Includes continuation of Advanced Development activities, and beginning of follow-on procurement (using procurement dollars under the related program element, 27586F). FY 1985 includes the initiation of "bus transceiver family" and optical multiplexing tasks. FY 1987 begins the development of direct RF remoting using fiber optics.

C. (U) Major Milestones: Not Applicable.

8. (U) PROJECTS OVER $10M IN FY 1984: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63727F
DoD Mission Area: #345, Tactical Communications

Title: Advanced Communication Technology
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	3,280	6,106	5,024	4,850	Continuing	Not Applicable
2345	Jam Resistant Data Link Technology	2,230	3,706	2,000	3,000	Continuing	Not Applicable
2746	Low Probability of Intercept Comm	200	700	1,400	1,000	Continuing	Not Applicable
2747	Communication Vulnerability Analysis	800	900	724	750	Continuing	Not Applicable
2748	Advanced High Frequency Technology	50	800	100	100	Continuing	Not Applicable

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Modern military systems and weapons derive much of their value from the communication systems which provide the primary means of force coordination and battle management.

This program provides continuing research and development of new communication technologies to offset this threat evolution and to insure viable communications during the 1980s and 1990s. Specific emphasis is being placed on the development of: a jam resistant reconnaissance data link for penetrating, low altitude reconnaissance vehicles; low probability of intercept tactical communications; the analysis of the vulnerability of command, control and communication (C^3) systems; and advanced high frequency communication technology.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

RDT&E	5,280	6,106	5,243

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands): Not applicable.

5. (U) RELATED ACTIVITIES: This program is part of a coordinated effort to improve communication capabilities. As such, it is related to Command, Control and Communications, PE 62702F; Command, Control and Communication Advanced Development PE 63789F; and Advanced Communication Systems, PE 27423F. Advanced data link technology efforts will develop an advanced, wideband jam-resistant data link for real and near-real time reconnaissance efforts in Electronic and Physical Sciences, PE 63208F; and Tactical Surveillance, Reconnaissance, and Target Acquisition, PE 64710F. Data link development

tasks are coordinated with the Army Modular Integrated Communication, Navigation System, PE 64748A. Advanced adaptive high frequency communications developments conducted within this program element will transition to PE 33131F, Minimum Essential Emergency Communications Network (MEECN).

6. (U) WORK PERFORMED BY: Air Force Systems Command (AFSC), Air Force Wright Aeronautical Laboratories/Avionics Laboratory, Wright-Patterson AFB, OH and Rome Air Development Center (RADC), Griffiss AFB, NY. There are currently a total of five contractors. They are: Sperry Univac Corporation, Salt Lake City, UT; Harris Corporation, Melbourne, FL; Georgia Institute of Technology, Atlanta, GA; Syracuse Research Corporation, Syracuse, NY; MITRE Corporation, Bedford, MA. Total dollar value of all contracts is $8,931,000.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 2345, Jam Resistant Data Link Technology: This program will provide the advanced data link technology required to counter the Soviet threat during the late 1980s and beyond. While the technology developed is applicable to all classes of data links, specific emphasis is being placed on the development of a wideband, jam resistant data link for near real time air-to-air reconnaissance imagery transmission to support low altitude penetrating vehicle reconnaissance missions. The extended range provided by the air-to-air data link being developed in this program will compliment the existing air-to-ground standoff surveillance/ reconnaissance capability and provide the theater commander with the total battlefield picture. This program directly supports the requirements of TAF SON 320-79 and MENS 320-79, Advanced Tactical Air Reconnaissance System, and also supports TAF SON 317-79, Continuous Battlefield Standoff Surveillance System.

program emphasis will be placed on achieving the required jamming margins while reducing detectability of transmissions through antenna nulling and beam forming, information compression, extremely wide bandwidth spread spectrum modems, and optimum coding techniques.

(U) This effort was an FY 82 new start, but builds upon technologies developed in this project in prior years. During FY 82, a threat assessment and two competing design concept studies were initiated. A characterization of a previously developed multibeam antenna array (Lincoln Laboratory) was completed. This antenna is a potential candidate for use in this program. An assessment of the feasibility of operating at millimeter wave frequencies for increased covertness was made. Also initiated in FY 82 was the acquisition of an interoperable data link (IDL) to perform the airto-ground portion of the total air-to-air-to-ground flight test demonstration. In FY 83, effort on the design concept studies, threat assessment, and IDL acquisition continues. In FY 84, the design concept studies will be completed. The preferred approach will be selected, and brassboard design and fabrication will be initiated under a new competitive contract award. The threat assessment will be completed for use in the brassboard design. Future milestones include completion of hardware fabrication in FY 87, and completion of flight testing in FY 90.

B. Project 2746: Low Probability of Intercept (LPI) Communication: Present and future AF tactical plans require the use of stealth in the penetration, execution, and withdrawal phases of various missions. This requirement was established by the need to reduce the effectiveness of the ever increasing number of sophisticated hostile threats.

Program Element: #63727F
DoD Mission Area: #345, Tactical Communications

Title: Advanced Communication Technology
Budget Activity: #4, Tactical Programs

This program will provide the jam resistant LPI communication system technology necessary to reduce the physical vulnerability of airborne platforms to detection, location, and subsequent destruction through exploitation of radio signals. This technology program will augment other low observables avionics programs by ensuring that communications eminations are not the "weak link" to negate the effectiveness of stealth vehicles.

The Air Force has ongoing programs to develop an anti-jam communication capability (i.e., HAVE CLEAR, JTIDS). These future spread spectrum radio waveforms will provide some limited LPI capability; however, the high transmitter power requirement to achieve an anti-jam capability is not consistent with the need for reduced avionics and communications observables. This FY 82 new start project was created to address this need and at the same time support TAF ROC 321-75, Jam Resistant Secure Voice Communication.

(U) In FY 82, an LPI technology and threat assessment effort was initiated to develop a battlefield signal environment model for the current and 1995 time frames and recommend optimum ESM receiver approaches. Also started in FY 82 was an effort to perform a comparative analysis of the vulnerability of airborne radar and communication systems to electromagnetic detection, characterization, location, and tracking. This analysis is vital to the definition of performance standards for future LPI radio systems. In FY 83, the two efforts started in FY 82 will be completed, and the information obtained will be used in two new efforts. An LPI technology evaluation effort will be started to evaluate through analysis and simulation the effectiveness of various LPI techniques, and develop an LPI radio system conceptual design. Also started in FY 83 will be an effort to develop a conceptual design for an ESM receiver optimized against LPI signals. These two efforts will continue through FY 84 and be completed in FY 85. Hardware development will begin in FY 85 culminating in a flight test demonstration of an LPI radio system in FY 89.

C. Project 2747: Communication Vulnerability Analysis (CVA): As a result of a deployed Soviet C^3 countermeasure threat, the Air Force is investing heavily in ECCM systems. At the same time, Soviet ECM technology continues to evolve.

The Air Force needs to consolidate this expertise and develop a comprehensive methodology for vulnerabilities analysis and testing of communications systems, including large, netted C^3 systems. This FY 82 new start program was created to address this need. The CVA project will consolidate the technical efforts and expertise in communications vulnerability analysis, and will develop, test, and evaluate a comprehensive methodology and special test equipment for assessing the vulnerability of developmental C^3 technology, equipment, and systems to detection, deception, exploitation, and jamming. This program will give the Air Force an evaluation tool that can be applied to advanced communication systems during their development, thereby reducing costly "after the fact" system modifications and greatly increasing the degree of confidence of decision makers in approving systems for further development and production. In FY 82, initial effort began on combining the efforts of DoD technology, test, and electromagnetic security communities to support analysis and testing of ECCM systems by performing a preliminary vulnerability assessment on the Lincoln Laboratory Jam Resistant Secure Voice Communication (JRSVC) system

Also in FY 82, efforts were initiated in consolidating Air Force ECCM threat data bases, and in defining special test equipment and test bed requirements for complete vulnerability analyses. In FY 83, the primary methodology development effort will be started. This effort will take an existing methodology for assessing the vulnerability of point to point RF data links developed by the Data Link Vulnerability Analysis (DVAL) Joint Test Force, and will extend it to allow complex network assessments. Also starting in FY 83 will be an effort to quantitatively define various vulnerability parameters for communications systems. Efforts begun in FY 82 will continue. The vulnerability definition and threat data base consolidation efforts will be completed in FY 84. Work will continue on methodology development and test bed definition. A comprehensive methodology will be defined by FY 85, and will be thoroughly tested and evaluation for transition by FY 88.

D. Project 2748: Advanced High Frequency Technology: Traditionally, HF radio has been used as a primary means of long range communications by military forces. However, in past years, its use has been de-emphasized because of its susceptibility to jamming, nuclear effects, and natural ionospheric disturbances. Coupled with this has been the increase emphasis on the use of satellite systems to provide worldwide communications.

Consequently, the Air Force requires reliable alternative communication systems to satellite systems. Both MAC and SAC have stated requirements for this improved capability (SAC ROC 5-77, MAC GOR 3-77).

Advanced capability ECCM modules will be developed that are compatible with the Modular HF Radio being initiated through full scale development in PE 33131F (MEECM). In FY 82 there were no contractual efforts. Effort concentrated on initiation of a contractual effort to begin in FY 83. This contract will develop the modules mentioned above. Current funding will allow the development of modules to address voice source encoding over narrowband HF channels, adaptive channel equalization, adaptive signal processing, and frequency hopping. Module development will continue through FY 84 and FY 85. In FY 86, an HF modem and fast frequency hopping antenna coupler will be completed for transition to PE 33131F. In FY 87, a limited vocabulary voice encoding/decoding module will be completed.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63742F — Title: Combat Identification Technology
DOD Mission Area: #344, Tactical Command and Control — Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	11,194	14,986	14,029	11,907	Continuing	Not Applicable
1177	Noncooperative Identification Techniques	3,335	5,500	2,900	2,900	Continuing	Not Applicable
2599	Cooperative Identification Technology	7,859	9,486	11,129	9,007	Continuing	Not Applicable

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The purpose of this program element is to accomplish advanced development of technology that can be used to provide reliable long range identification of airborne targets in both all-weather and hostile electromagnetic countermeasure environments. This program is necessary because the numerical superiority of the projected threat demands that we be capable of engaging the enemy at long ranges with our beyond visual range weapons. The long range identification that is a prerequisite for such engagements

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

RDT&E	14,744	17,486	19,644	Continuing	Not Applicable

(U) The $3.55, $2.5 and $5.615 million reductions in FY 1982, FY 1983 and FY 1984 respectively reflect the slowed pace of Mark XV development under Project 2599 pending North Atlantic Treaty Organization (NATO) agreement on the system's operating frequency. The FY 1982 and FY 1983 funds were reprogrammed to support high priority Air Force programs.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable

5. (U) RELATED ACTIVITIES: Work accomplished under this program element is part of an integrated Tri-Service effort to improve United States identification capabilities worldwide. Related activities include: Program Element (PE) 63267N, NATO Future Identification System; PE 63515N, Advanced Identification Techniques; PE 63706A, IFF Developments; PE 64211N, AIMS/ATCRBS/Mark XII; PE 64709A, IFF Equipment; and PE 64725F, Combat Identification Systems. Coordination and integra-

tion of the various activities under these program elements is accomplished through the Combat Identification System Program for which the Air Force is lead service.

.. (U) WORK PERFORMED BY: The overall program is managed by the Combat Identification System Program Office at the Aeronautical Systems Division, Air Force Systems Command, Wright-Patterson Air Force Base, OH. The Air Force Wright Aeronautical Laboratories/Avionics Laboratory, Wright-Patterson Air Force Base, OH is managing Project 1177 for the Combat Identification System Program Office. Contractors supporting Project 1177 are: Bendix Corp., Baltimore, MD; Hughes Aircraft Co., Culver City, CA; McDonnell Douglas Aircraft Corp., St. Louis, MO; Loral Electronic Systems, Yonkers, NY; and and Veda Inc., Dayton, OH. Contractors providing support to Project 2599 include: Dynamics Research Corp., Wilmington, MA; Bendix Corp., Baltimore, MD; E-Systems, St. Petersburg, FL; and Hazeltine Corp., Greenlawn, NY. Support is also provided by the Massachusetts Institute of Technology Lincoln Laboratory, Lexington, MA and the Electromagnetic Compatibility Analysis Center, Annapolis, MD.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 1177 Noncooperative Identification Techniques: Beyond visual range identification of airborne targets is In March 1978, North Atlantic Treaty Organization (NATO) Long Term Defense Program Task Force Five on Air Defense Similarly, the need for improved identification capability has been documented by Tactical Air Forces Statements of Need 304-79 and 305-79 and more recently in a Joint Mission Element Need Statement approved by the Secretary of Defense on 30 October 1980.

Because of several complementary cooperative and noncooperative identification techniques, as well as their integration are being developed under the Air Force led, Tri-Service Combat Identification System Program. This project accomplishes the advanced development of techniques for performing noncooperative target identification. Included in these techniques is the Radar Warning Receiver/Fire Control Interface Software (RFIS) effort to demonstrate the feasibility of using radar warning receiver information to establish accurate multiple target tracks and identifications for beyond visual range air-to-air missile fire control. Contract work was begun in FY 1982 for interface design and algorithm development to be completed in FY 1983. Engineering simulations will then be conducted and result (FY 1984) in specifications for use in the conduct of an integration/demonstration program. The latter would address available near-term hardware (e.g., ALR-69 radar warning receiver) as well as the final design for the New Threat Warning Receiver. Another technique in development is Multi-Source Integration (MSI) which will demonstrate the feasibility and utility of integrating cooperative, noncooperative, active and passive, direct and indirect identification information onboard the aircraft to provide high confidence identification of air-to-air targets beyond visual range. FY 1982 activity included contractual work to define and analyze the approach for implementing an integration algorithm and associated display concepts. This will culminate in a man-in-the-loop simulation in FY 1983, the results of which will define the initial implementing algorithm and transition to engineering development under Program Element 64725F in FY 1984. The results will also serve as the basis for continued development of an advanced integration algorithm (i.e., application of statistical weighting techniques and the addition of other identification information sources). Other work includes development of a radar signal processing algorithm to

Program Element: #63742F
DOD Mission Area: #344, Tactical Command and Control

Title: Combat Identification Technology
Budget Activity: #4, Tactical Program

to perform identification (begins in FY 1983 and continues in FY 1984). Also, beginning in FY 1983, the potential for space-based platforms to perform noncooperative target identification will be investigated with advanced development activities initiated in FY 1984 as appropriate.

8. (U) PROJECTS OVER $10 MISSION IN FY 1984:

(U) Project: 2599 Cooperative Identification Technology

A. Project Description: The principal method now used for target identification is an electronic question and answer system which is the Mark X or Mark XII. The Mark XII system is a Mark X system with an added cryptographic computer to encypher the question and answer. This equipment is capable of identifying friends similarly equipped. The Mark X system is not secure (i.e., it can be read and spoofed) and is used by foes, friends and neutrals alike for air traffic control purposes. In 1955 the International Civil Aviation Organization provided a Mark X system to the Warsaw Pact for air traffic control standardization. As a result, the United States developed the Mark XII in 1958 to provide a secure identification capability. The Mark XII system,

Also, the enemy can

Thus, pilots, for example, are faced with the serious dilemma of turning on their Mark XII equipment and permitting enemy exploitation or turning it off and being declared a foe by friendly air defense forces. Because of this uncertainty, combat rules of engagement frequently require a positive visual identification to be made before an engagement. This puts a severe restriction on our modern weapons which are capable of being launched far beyond visual identification range as well as placing the delivering weapon system in unnecessary danger. The need for improved identification capabilities is well documented. In March 1978 the North Atlantic Treaty Organization's Long Term Defense Program Task Force Five on Air Defense

Similarly, the need for improved identification capability has been documented by Tactical Air Forces Statements of Need 304-79 and 305-79 and more recently in a Joint Mission Element Need Statement approved by the Secretary of Defense on 30 October 1980. This project is part of a Tri-Service (Air Force led) effort, under the Combat Identification System (CIS) Program, to evolve comprehensive and balanced improvements to United States (U.S.) identification capabilities worldwide. For these improvements to have maximum effectiveness they must be interoperable with the identification capabililties of U.S. allies. To this end the U.S. is cooperating with the other North Atlantic Treaty Organization (NATO) nations to reach agreement on the basic operating characteristics (e.g., signals-in-space) of future identification equipment. The work in this project addresses the development of a direct, cooperative identification system (e.g., use of cryptographically secure questions and answers), called the Mark XV to replace the aging Mark XII system. This work is complemented by direct, noncooperative and indirect identification techniques being pursued by other projects within this and other program elements. The thrust of the effort is the selection of design approaches for which advanced development models will be competitively built and tested. The results of such tests will support the initiation of full scale engineering development activities under Program Element 64725F and will also provide the basis for validating the interoperability agreement with NATO prior to its formal ratification by the NATO nations.

Program Element: #63742F
DOD Mission Area: #344, Tactical Command and Control

Title: Combat Identification Technology
Budget Activity: #4, Tactical Program

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: During this period govenment and contractor teams investigated various conceptual designs for the NATO interoperable Mark XV identification system. Various operating frequencies and signal structures were analyzed to assess their performance (e.g., jam resistance), potential interference to other military and civil systems, ease of weapon system integration and transition into the force and relative cost-effectiveness. This resulted in a U.S. position in NATO that the operating frequency for the new system should be the same (i.e., L-band) as that of the Mark XII system which it is replacing. The Europeans prefer a higher frequency (i.e., S-band) and requested waveform specifications for an L-band design approach to assess the merits of the U.S. position. Additional design analyses were conducted and the Services agreed on the key waveform parameters for an L-band design to serve as the basis for NATO negotiations. The waveform parameters were also selected to be compatible with the ongoing study to define an Anti-Jam Communications Architecture. The L-band waveform design was officially provided to NATO in September and accepted as the basis for subsequent evaluation to reach NATO agreement on an operating frequency. Also, during this period industry was asked to provide proposals, covering L and S-band options, for fabrication and test of Mark XV advanced development models.

(2) (U) FY 1983 Program: A joint U.S./NATO (i.e., France, Germany and United Kingdom) evaluation of the U.S. candidate L-band system design will be completed. The evaluation addresses frequency allocation (based on compatibility with civil air traffic control systems), operational requirements (based on level of jam resistance provided), cost and ease of transition into the force structure. The results of this evaluation are expected to support a NATO agreement on the system's operating frequency and waveform parameters by spring. This agreement will serve as the basis to begin the demonstration/validation phase of the Mark XV design. Evaluation of industry proposals will be completed. Contracts will be awarded to competitively build and test advanced development models. Also, technology application and design studies will be conducted to support continued NATO discussions and analyses as well as to determine the most cost effective level of performance to build into the system.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Competitive development and fabrication of the Mark XV advanced development models begun in FY 1983 will continue as will supporting technology application and analysis studies. The cost estimate is based on a parametric analysis conducted by the Combat Identification System program office during the summer of 1982 and maintains outyear competitive development to support testing and formal NATO ratification of the system design/interoperability parameters.

(4) (U) Program to Completion: Fabrication of advanced development models will be completed and testing conducted to experimentally validate key system parameters as defined in NATO Standardization Agreement (STANAG) 4162. Once successfully tested for NATO interoperability, this STANAG will be ratified by the U.S. and other NATO nations. The system will transition to engineering development under Program Element 64725F. Unique technology applicable to the cooperative system will continue as appropriate. This is a continuing program.

Program Element: #63742F
DOD Mission Area: #344, Tactical Command and Control

Title: Combat Identification Technology
Budget Activity: #4, Tactical Programs

C. (U) Major Milestones:

	Milestones		Dates
(1)	Tactical Air Forces Statements of Operational Need 304-79 and 305-79		1979
(2)	Joint Mission Element Need Statement		1980
(3)	DSARC I	*(1982)	1983
(4)	Ratification of NATO Standardization Agreement (STANAG)	*(1985)	1986
(5)	DSARC II	*(1985)	1986
(6)	DSARC III	*(1987)	1988

* Date presented in Fiscal Year 1983 Descriptive Summary

(U) EXPLANATION OF MILESTONE CHANGES: DSARC and NATO STANAG dates (i.e., items 3 through 6 above) slipped one year because of the delay in reaching NATO agreement on the system operating frequency as described in paragraph 8.B.(1) above.

Budget Activity: Tactical Programs, #4
Program Element: #63742F, MARK XV

Test and Evaluation Data

1. (U) Development Test and Evaluation (DT&E: The Aeronautical Systems Division (ASD) of the Air Force Systems Command is the program manager for this tri-service program. DT&E is currently projected to be conducted in two phases (DT&E-I and II) with the first phase to commence in Mid FY 85. DT&E-I will consist of Advanced Development Model equipment tested under laboratory conditions in the Demonstration/Validation contractor's facilities with additional Demonstration/Validation testing to be conducted using Air Force ASD/4950th Test Wing aircraft which will be modified for Mark XV testing. Army and Navy identification friend or foe (IFF) platforms will be modified as required. Flight testing conducted during DT&E-I will demonstrate design concepts in an airborne demonstration of expected performance using simulated threat and signal densities in the live demonstration. DT&E-I testing will be combined where possible with IOT&E testing utilizing Advanced Development Model hardware. This testing will be conducted in the Wright-Patterson AFB area utilizing the 4950th modified T-39 and C-141 aircraft and the ASD IFF ground station equipment; at Naval Air Test Center (Pax River) for overwater multipath; and at Nellis AFB under Electronic Countermeasure conditions.

(U) DT&E-II will be conducted as part of the Full Scale Development effort with the 4950th Test Wing as the responsible test organization. Emphasis during this phase will be placed on Mark XV reliability under expected combat conditions, interoperability with NATO Mark XV equivalent systems, demonstration of Full Scale Development contract specified performance parameters, and estimation of maintainability and supportability.

2. (U) Operational Test and Evaluation (OT&E): AFTEC has been directed to manage the Mark XV IFF tri-service OT&E program supported by OTEA and OPTEVFOR. The initial operational test and evaluation (IOT&E) of the Mark XV will be conducted during both the demonstration and validation (D&V) (IOT&E-I) and the full-scale development (FSD) (IOT&E-II) portions of the program. The very early involvement of AFTEC in IOT&E has been dictated by a need to avoid having IOT&E and DT&E results and conclusions late in the program which are significantly different. The Mark XV IOT&E-I and IOT&E-II have each been divided into two phases. The total four-phase IOT&E is summarized below.

a. (U) IOT&E-I phase 1. This phase addresses the evaluation to be conducted prior to advanced development models (ADMs) being available for test. It will provide an early evaluation of the operational utility of the Mark XV design approach. Data from simulations, interviews, documentation reviews, and questionnaires will be used in the evaluation. Simulations will be managed and analyzed by AFTEC and conducted by the Electromagnetic Compatibility and Analysis Center (ECAC). This phase is scheduled from October 1983 through January 1985.

Budget Activity: Tactical Programs, #4
Program Element: #63742F, MARK XV

b. (U) IOT&E-I phase 2. This phase begins when the ADMs are provided to the government for testing. It will provide the first look at operational performance of the prototype Mark XV hardware and will provide information for updating and refining of the simulation models used for phase I. This test will be a combined tri-service DT&E/IOT&E. Test beds will include: AF (C-141, T-39), Navy (TA-3B, E-2C) and Army (UH-60) airborne platforms, Army (Patriot or I Hawk, Stinger) air defense platforms, and an AF (TPS-43) surveillance radar. The Mark XV IFF interrogator equipment will be integrated with an airborne fire control radar in the C-141. Test sites will be Wright-Patterson AFB, OH; Eglin AFB FL; Nellis AFB, NV; Ft Bliss TX; Ft Huachuca, AZ; Patuxent River NAS; and Pt Mugu NAS. This phase is scheduled for March 1985 to March 1986.

c. (U) IOT&E-II phase 1. This phase will evaluate preproduction equipment in operational platforms. It will include extensive tri-service field testing under operational conditions in both multi-service and service-unique scenarios. OTEA and OPTEVFOR will manage the OT&E on their particular service scenarios. AFTEC will manage AF and multi-service scenarios. Test platforms will include: AF (F-15, F-16, E-3A), Navy (F-14, F-18, E-2C), Army (AH-IT, AH-64) airborne platforms, Army (Patriot, Stinger, Divad) air defense platforms, Navy (cruiser and destroyer surface combatants, and an AF tactical radar system. Test sites will be Nellis AFB, NV; Eglin AFB, FL; Patuxent River NAS; Pt Mugu NAS; Ft Bliss, TX; Ft Huachuca, AZ; and Ft Rucker, AL. This phase is scheduled for FY 88-89.

d. (U) IOT&E-II phase 2. This phase will be similar to IOT&E-II phase 1 but will involve US- and NATO-built Mark XV IFF equipment on US and NATO platforms. Platforms are yet unspecified. Test sites have not been selected but most likely will be located in West Germany. This phase is scheduled for FY 89-90.

(U) Lessons learned from the recently conducted Mark XII IFF technical improvement program (TIP) IOT&E will be extremely valuable in the conduct of this IOT&E. The different results between its DT&E and IOT&E (DT&E favorable and IOT&E unfavorable) highlight the importance of early OT&E on IFF systems.

3. System Characteristics: Characteristics for the Mark XV will be definitized during the demonstration/validation phase. The primary objective of the program is to develop a NATO interoperable, jam resistant, and secure cooperative system to identify friendly aircraft. Specific thresholds for the Mark XV system will be identified before the Defense System Acquisition Review Council (DSARC) II review.

Characteristic	Objective (Goal)	Demonstrated	Remarks
Operational Range	Platform Dependent For example (Representative goals):	To be determined	Will be equal to or greater than primary weapon system sensor range
	Fighter Aircraft (e.g., F-15/F-14)		
	Airborne Early Warning (e.g., E-3A)		

Budget Activity: Tactical Programs, #4
Program Element: #63742F, MARK XV

Characteristic	Objective (Goal)	Demonstrated	Remarks
	Surveillance Radar (e.g., TPS-43		
	High Altitude Missile Air Defense (HIMAD) (e.g., Patriot)		
	Man Portable Air Defense (MANPAD) (e.g., Stinger)		
System Capacity	interrogations/ second	To be determined	Based on most dense European environment
Anti-Jam Performance	jamming/signal margin	To be determined	Based on broad band noise jamming
Identification Reliabilities			
P (Friend Acceptance/ Friend)		To be determined	Probability of accepting a friend given he is a friend
P (Friend Rejection/ Friend)		To be determined	Probability of rejecting a friend given he is a friend
P (Enemy Acceptance/ Enemy)		To be determined	Probability of accepting an enemy given he is an enemy
(U) Reliability/ Maintainability/ Availability			
Mean Time Between Failure	1000 hrs	To be determined	System specified on demonstration in laboratory
Mean Time To Repair	30 minutes	To be determined	On site maintenance

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63770F[1] Title: Joint STARS Advanced Development
DoD Mission Area: #217 - Land Warfare Surveillance & Reconnaissance Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	5,180	2,003	4,026	3,365	3,326	62,100

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: A critical need exists for an effective new capability to attack numerically superior Warsaw Pact second echelon armored mobile ground forces. To fill this need, the Department of Defense has undertaken the Assault Breaker/Joint Surveillance and Target Attack Radar System (Joint STARS) Army/Air Force program, a cooperative standoff (including antiarmor) concept, as a high priority initiative. Joint STARS is the radar sensor and control subsystem and will detect and track second echelon enemy forces and guide accurate attacks against them via standoff missiles and direct attack aircraft.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in Thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
RDT&E 1/	5,180	2,003	4,202		7,072	63,894

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable

5. (U) RELATED ACTIVITIES: There is no other system planned to provide moving and limited fixed target detection and tracking as well as real-time aircraft cue-vectoring and/or standoff missile guidance against second echelon armor. Currently, this mission is performed on a preplanned (24 hour) basis. Joint STARS Full Scale Engineering Development, to include weapon interfaces and command and control element interfaces, will be conducted under Program Element 64770F 2/ and the companion Army program element, PE 64770A.

(U) The Conventional Standoff Weapon will be developed for employment from both tactical and strategic aircraft against a variety of key targets. Equipped with appropriate antiarmor submunitions, the Conventional Standoff Weapon will provide the standoff missile element of the Interdiction Program concept for application with the Joint STARS. The Conventional

1/ This program was previously covered under #63747F, "PAVE MOVER" and shown as such in the R-1.
2/ This program was previously covered under #64616F, "PAVE MOVER Engagement System" and shown as such in the R-1.

Standoff Weapon (Program Element 64606F) has been merged with the Army's Corps Support Weapon System (PE 64324A) in a Joint Tactical Missile System (JTACMS) program, with the Air Force Conventional Standoff Weapon Program Element renumbered as PE 64324F.

6. (U) WORK PERFORMED BY: This advanced development program is managed by the Air Force Systems Command at the Rome Air Development Center, Griffiss AFB, NY. Two advanced development model airborne PAVE MOVER radars have been developed and participated in the Assault Breaker End-to-End Technology Demonstration at White Sands Missile Range, NM. Contractors for the continuing demonstration of these two advanced development model radars are Hughes Aircraft, El Segundo, CA, and Grumman Aircraft, Bethpage, NY teamed with Norden systems, Norwalk, CT.

(U) Lincoln Laboratory, Lexington, MA, assists the Rome Air Development Center in evaluating/documenting the performance of the advanced development model PAVE MOVER radars with particular emphasis on radar characterization and the evaluation of the radar electronic counter countermeasures and low probability of intercept performance.

7. (U) Joint STARS (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984)

A. (U) Project Description: The Joint STARS Radar is an airborne advanced technology demonstration system incorporating moving target indicating and synthetic aperture radar techniques to provide the capability to detect and track moving targets from standoff ranges and to direct accurate attack. Joint STARS directs accurate attack by cue-vectoring attack aircraft and by providing guidance data to a standoff missile. This program directly contributes to the OSD-directed Army, Air Force Joint Surveillance and Target Attack Radar System (Joint STARS) program as the concurrent advanced development activity.

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: This program has produced the PAVE MOVER advanced development airborne radars/ground fire control centers that have successfully completed the DARPA/Army/Air Force Assault Breaker Demonstration. The PAVE MOVER ADM radars demonstrated the ability to (1) guide standoff surface-to-surface missiles targeted against moving armored vehicles and (2) cue vector a low altitude penetrating F-4 aircraft. The radars proved capable of detecting and tracking moving ground vehicles
azimuth abeam of the aircraft. The PAVE MOVER ADM radars can also provide a small area
spot image mode having a resolution for the detection/track of stopped vehicles. The inherent narow beam of the radar, coupled with a relative guidance scheme, is designed for a total system strike accuracy (including target location, weapon location, and guidance and control errors) of

(2) (U) FY 1983 Program: The PAVE MOVER advanced development airborne radars and ground processing stations continue to be demonstrated and evaluated at White Sands Missile Range, NM. The radars have recently demonstrated true multi-mode capability, through which wide-area MTI surveillance and high-resolution Synthetic Aperture Radar imagery functions are interleaved in near-real time. FY 1983 activities include the characterization of the radars, of their electronic counter-countermeasure (ECCM) capability, and of their low probability of intercept potential. Additionally,

advanced development will be conducted on man-machine interrelationships with emphasis on development of automatic aids in the areas of weapon control and assignment, target recognition and designation, and sensor management.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Funds are requested so that advanced development of improved electronic counter countermeasures and target discrimination techniques will continue, to include hardware/software brassboarding and ground evaluation. Advanced development of man-machine and machine-to-machine relationships will continue, to assist the command and control tasks associated with the total system integration of multiple sensor types in the command, control, and communication context.

(4) (U) Program to Completion: Improved techniques for electronic counter countermeasures techniques, target discrimination techniques, and man-machine and machine-to-machine interfaces will be evaluated and transitioned to Program Element 64616F for inclusion in the Joint STARS Full Scale Development Program.

C. (S) Major Milestones: Milestones are keyed to Joint STARS major milestones.

Milestones	Dates
(1) (U) Joint STARS FSD RFP Release	2Q FY 1983
(2) (U) Joint STARS FSD Contract Award	4Q FY 1983
(3) Joint STARS Initial Operational Capability	- -

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63749F Title: C^3 Countermeasures Advanced Systems
DOD Mission Area: 372 - Escort, Stand-off, and Counter C^3 Budget Activity 2 - Advanced Technology Development

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0	0	1,902	2,801	Continuing	N/A
2947	Advanced C^3 Countermeasures	0	0	1,902	2,801	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Successful accomplishment of the various Air Force operational missions requires the capability to disrupt enemy command, control, and communications (C^3) systems. With this capability the Air Force can isolate selected enemy units from their command and control, thereby significantly reducing the effectiveness of those units. This program provides development and system feasibility demonstrations of promising new C^3 countermeasures equipments. The work will include long-range planning and architecture development for both tactical and strategic applications, investigations to develop new C^3 countermeasures systems and improve fielded systems, and studies of future C^3 countermeasures possibilities.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

Not Applicable. This is a new Program Element, effective FY 1984.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

None

5. (U) RELATED ACTIVITIES: This program was created to provide greater visibility to C^3 countermeasures advanced developments and to accelerate their transition into full-scale development. Laboratory investigations to develop new C^3 countermeasures capabilities will remain in Program Element 63718F, Project Number 2754 - C^3 Countermeasures. Technology that satisfies similar requirements for other systems may be drawn upon, such as those in PE 62204F, Aerospace Avionics; PE 62715A, Expendable Jammers; and PE 63214N, Tactical C^3 Countermeasures. This program provides advanced development for PE 64724F, Tactical C^3 Countermeasures.

6. (U) WORK PERFORMED BY: The Electronic Systems Division of the Air Force Systems Command, Hanscom AFB, MA is responsible for management of this program.

Program Element: 63749F   Title: C^3 Countermeasures Advanced Systems
DOD Mission Area: 372 - Escort, Stand-off, and Counter C^3 Budget Activity: 2 - Advanced Technology Development

7. (U) C^3 COUNTERMEASURES ADVANCED SYSTEMS (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984):

A. (U) Project Description - In FY 1981 the Department of Defense recognized the need to create an advanced development program element to support and give visibility to C^3 countermeasures developments and to transition these developments from exploratory to engineering development. As a result, this program element was specifically created to provide long range planning and overall C^3 countermeasures architecture development, to develop improvements to fielded systems as new technologies mature, and to study future C^3 countermeasures possibilities using advanced/new technology.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Not applicable. This is an FY 1984 new start.

(2) (U) FY 1983 Program: Not applicable. This is an FY 1984 new start.

(3) FY 1984 Planned Program and Basis of FY 1984 RDT&E Request: This program element is an FY 1984 new start. The FY 1984 program will begin the definition phase of several efforts including advanced C^3 jamming and destruction capabilities and C^3 countermeasures testbed requirements.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64201F
DOD Mission Area: #223, (Interdiction/Naval Strike)

Title: Aircraft Avionics Equipment Development
Budget Activity: #4, Tactical Program

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Complete	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	16,001	16,137	21,752	26,218	Continuing	N/A
2257	Standard Avionics Development	2,000	3,000	4,400	7,100	Continuing	N/A
2297	Software and Computer Standardization	2,800	2,200	2,500	2,800	Continuing	N/A
2519	Radar Programmable Signal Processor	6,991	5,937	8,752	11,618	Continuing	N/A
2560	Jovial Language Control Facility	700	900	1,100	1,600	Continuing	N/A
2590	Standard Fuel Savings Advisory System/ Simplified Fuel Savings System	1,710	100	500	100	0	7,805
2658	Avionics Architecture Implementation and Support	0	1,000	2,000	3,000	Continuing	N/A
2771	Standard Central Air Data Computer	1,800	3,000	2,500	0	0	7,300

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The high cost of operating and maintaining our forces is reducing operational capability and readiness. This program element develops standard architecture and airborne electronic equipment that will reduce support costs and allow technology evolution to provide overall operational force improvement. Typical products include a joint US Air Force/Navy air data computer development, radar software applicable to tactical and strategic forces, and fuel savings systems to conserve at least 3% of trip fuel in the C-5, C-141 C-135, and C-130 aircraft.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: $ In Thousands)

RDT&E	13,051	21,237	26,563	Continuing	N/A

FY 82 - (+2950) Reprogrammed funds to support B-1B Avionics Standardization Studies (+1350 for project 2297) and Fuel Savings Advisory System (+1600 for proj 2590)

FY 83 - (-5100) The 4100 Congressional portion of this cut across the PE was aimed at MIL-STD-1750A (Instruction Set Architecture) work and related projects. The 1750A efforts that were ongoing were permitted to continue but no new tasks could be started. However, the funds were not restored. The cuts were made as follows: Project 2257 (-700), Project 2519 (-3500), and Project 2658 (-900).

FY 84 - (-4811) This cut was taken to fund higher priority projects and was made as follows: Project 2519 (-3248), Project 2658 (-608), and Project 2257 (-955).

Program Element: #64201F
DOD Mission Area: #233, Interdiction/Naval Strike

Title: Aircraft Avionics Equipment Development
Budget Activity: #4, Tactical Program

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable

5. (U) RELATED ACTIVITIES: This program is closely coordinated with the Army and Navy to maximize joint developments where feasible. A tri-service memorandum of agreement has been established to promote interservice standardization. Currently a joint effort with the Navy's Program Element 64203N, Avionics Components and Subsystems, is underway to develop a standard air data computer. There is a close relationship between the products of this program and the technological building blocks developed in advanced and exploratory development programs such as PE 63203F, Advanced Avionics for Aircraft; and PE 62204F, Aerospace Avionics. Techniques, components and subsystems showing high payoff potential can be progressively transitioned through the development process until a specific weapon system application is identified and an engineering development task established. The radar programmable signal processor project investigates the generic radar improvements possible (such as terrain following/terrain avoidance and synthetic aperture radar (SAR)) with initial application in the F-15, F-16 and B-1B. Electronic Counter Countermeasures (ECCM) test data obtained from PE 63750F will aid in developing software for the project. In addition, related efforts in PE 64740F Computer Resource Management Technology, support the software standarization and high order language effort within PE 64201F.

6. (U) WORK PERFORMED BY: Program management is provided by elements of the Air Force Systems Command with all project under the direction of the Aeronautical Systems Division, Wright-Patterson AFB, OH. Major contracts of Project 2257 are with The Analytic Sciences Corporation, Reading, Massachusetts and Aeronautical Radio Inc., Annapolis, MD. Project 2519 is contracted with Hughes Aircraft Corporation, Culver City, California through McDonnell Douglas for the F-15 and with Westinghouse Electric Corporation, Baltimore, Maryland for F-16 and B-1B applications. The Project 2560 contractor is SOFTEC Inc., Waltham, Massachusetts. Project 2771 contractors are Marconi Avionics LTD, Rochester, Kent, England and Garrett AiResearch, Torrance, Calif. Project 2297 contracts with TRW, Dayton,Ohio.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project 2257 - Standard Avionics Development: This project identifies subsystems that may be candidates for development efforts and/or designation as Air Force standards. Potential subsystems are evaluated for their standardization potential with hardware development initiated when appropriate. During FY 82 this project developed a standard specification for Crash Survivable Flight Data Recorders for fighter aircraft following the completion of a feasibility study. Initial development effort on a Digital Audio Distribution System (DADS) will continue in FY 83 and 84 with the finalization of a draft specification and the initiation of engineering development. During FY 83 a militarized version of a Ground Proximity Warning System (GPWS) proposed for fighter aircraft will be flight tested as part of an ongoing feasibility study. Based on a successful flight test, this effort will proceed with initial engineering development in FY 84. During FY 83 work should be completed on a MIL-STD for Packaging, Mounting, and Environment which will standardize the physical interface of aircraft "black boxes" with the aircraft. This project will also continue to support the Armament and Avionics Planning and the Air Force Systems Command Standardization Conferences, and the Avionics Data Utilization System (ADUS) in conjunction with the Army and Navy.

B. (U) Project 2297- Software and Computer Standardization. This project supports and maintains the Embedded Computer Resources Standardization Program Office (ECSPO) within the Air Force's Deputy for Avionics Control. The ECSPO provides Air Force weapon system programs with timely, high quality MIL-STD-1589B (JOVIAL) J73 compilers, MIL-STD-1750A Instruction Set Architecture, and the required support software for both. During FY 82 the major thrusts of this project were two fold. First, work was started to develop support software tools for error correction and software development/enhancement of JOVIAL compilers. Second, efforts were initiated to develop a J73 compiler for a DEC Vax 11 computer. These efforts will continue during FY 83 and 84 and will provide testing and support for the new Vax compiler when it is completed. In addition during FY 84 the ECSPO will incorporate F-16 Multi Stage Improvement Program (MSIP) developed support software into an Air Force support software package and will prepare to support Air Force peculiar Ada language software tools. Also in FY 84 a JOVIAL-Ada translation of a flight control application will be started.

C. (U) Project 2519-Radar Programmable Signal Processor: This project supports development of a generic programmable signal processor (PSP) for use with Air Force airborne radar systems. The PSP will permit substantial improvements in radar performance to be made through use of common software and architecture designs. Emphasis is on providing improved reliability and maintainability (R&M) and developing common mode capability among the F-15, F-16, and B-1B radar systems. Application of standardization initiatives are stressed throughout. During FY 82 this project initiated the development of a MIL-STD-1750A/J73 capability in the F-15 radar. An Operational Feasibility Evaluation of a generic Synthetic Aperture Radar (SAR) capability was also conducted. Continued evaluation of new air-to-ground modes (terrain following/terrain avoidance; SAR, electronic counter countermeasures) will continue in FY 83 and 84 as will the F-15 MIL-STD-1750A/J73 radar work. To further improve the operational and logistic capabilities for current and future aircraft radars a detailed reliability and maintainability effort will be initiated in FY 83 with recommendations developed for potential radar incorporations during FY 84. In addition, an effort will be started in FY 84 to develop an electronically agile antenna for fighter aircraft radar applications.

D. (U) Project 2560-Jovial Language Control Facility (LCF): This project maintains and controls MIL-STD-1589B by ensuring through validation that all new JOVIAL compilers conform to the MIL-STD. It also provides both government and industry users technical advice and assistance in using and accepting the JOVIAL language. During FY 82 the LCF continued its specific efforts on compiler validation, language extension and expansion, trouble reports, and document maintenance. Furthermore, this project supported the JOVIAL/Ada Users Group, published the JOVIAL LCF Newsletter, and conducted JOVIAL training classes for both government and industry personnel. For FY 83 and 84 these efforts will expand and continue as we anticipate validating up to 30 compilers, conducting 12 training classes and supporting eight Users' Group meetings. Additionally, it will prepare to become a validation facility for Ada following its transition into the avionics community.

E. Project 2590-Standard Fuel Savings Advisory System(FSAS)/Simplified Fuel Savings System(SFSS): This project evaluated hardware and developed software to permit aircrews to optimize flight trajectories and thereby save up to 3-5% of normal fuel usage. The FSAS is on-aircraft equipment which provides both flight planning and fuel savings data. Its development is effectively complete and initial aircraft (C-141 and C-5) incorporation is due to start in FY 83. The SFSS is a hand held calculator with fuel savings, air drop, and flight planning software. During FY 82 initial SFSS hardware and software were delivered to B-52, KC-135, C-5 and C-141 units. The FY 83 effort will continue with develop- of additional software for the C-5 and C-141 and addition of SFSS capability to the C/HC/WC-130 aircraft which will not receive the FSAS. This will be followed in FY 84 with software validation and initial delivery of the C-130 capability.

Program Element: #64201F | Title: Aircraft Avionics Equipment Development
DoD Mission Area: #422, Interdiction | Budget Activity: #4, Tactical Program

F. (U) Project 2658-Avionics Architecture Implementation and Support. This project maintains the SEAFAC (System Engineering Avionics Facility) needed to maintain, validate and verify, through compliance testing, implementations of standardized hardware (e.g., MIL-STD-1553B Mux Bus). It also provides consultation/engineering support for this and other related standards, as well as supporting standardization development efforts such as the Standard Central Air Data Computer and the Air Force Standard Medium Accuracy (F^3) Navigation System. Nine contractor built -1750A computers and fifteen contractor built -1553B data buses were verified in FY 82. This project also initiated a software development effort to automate the 1750A verification. In FY 83 and 84 these effors will continue. These efforts will be expanded in FY 84 to include validation and testing prototype development for MIL-STD-1760, Standard Aircraft/Stores Interface Definition, and preparation of a handbook. Additional tasks in FY 84 include preparation for Ada transition and standard validation for a high speed data bus. We also plan some limited hardware procurement to update the 4950th Test Wing aircraft with current/modern avionics hardware compatible with the various hardware and architectural standards. This will enhance their organic flight test capabiltiy in support of PE 64201F and other standard architecture projects.

G. (U) Project 2771 Standard Central Air Data Computer (SCADC): This project is designed to create a standard air data computer for multiple Air Force and Navy aircraft. Air Force application includes C-5, C-141, F-4, and F-111 aircraft while Navy application includes the A-7, A-6, and C-2. Qualification and environmental testing started in FY 82 will complete during FY 83. Flight testing (C-141 and F-4) is scheduled to start during FY 83 with initial hardware deliveries for C-5 use expected in FY 84. Flight testing and residual development tasks for SCADC will be completed in FY 84.

RDT&E	8,400	7,700	10,300	Continuing	N/A

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64212F — Title: Aircraft Equipment Development
DOD Mission Area: #223 - Close Air Support & Interdiction — Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	2,057	1,864	10,594	14,867	Continuing	Not Applicable
1926	Aircraft Windshield Dev	1,303	1,380	2,115	1,565	Continuing	Not Applicable
2098	Aircraft Accessories Dev	197	205	2,165	2,192	Continuing	Not Applicable
2377	Airdrop Systems Support	88	93	251	341	Continuing	Not Applicable
2709	Integrated Turbine Engine Monitoring System	0	93	4,306	9,360	46,600	63,132
4366	Integrated Attack Avionics	469	93	1,757	1,409	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Due to changing threat scenarios, equipment obsolescence and technical advancements, a need exists to update and modernize the aircraft force. A need also exists to correct deficiences that exist in operational aircraft in the areas of safety and improved systems effectiveness. This program element represents a collection of different but related projects which develop, test, and evaluate a variety of aircraft subsystem equipment to respond to these operational needs. Technological advancements in aircraft equipment are exploited and/or translated into operational hardware. This is the only engineering development program element which utilizes advanced state-of-the-art technology to develop windshield systems offering improved hazard resistance and reduced cost-of-ownership.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

RDT&E	2,192	1,864	17,614	----	Continuing	Not Applicable

FY 84 is a $7.4M reduction by Air Force to fund program shortfalls in other areas and meet overall adjustments directed by OSD.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands) - Not applicable.

5. (U) RELATED ACTIVITIES: Program Elements 62201F, Aerospace Flight Dynamics; 63211F, Aerospace Structural Materials; 63246F, Aircraft Subsystems Technology; and 63203F, Advanced Avionics for Aircraft, are related to this program element in that this element provides a means for completing the Engineering Development required to introduce equipment into the operational inventory. Program Element 64201F, Aircraft Avionics Equipment, is a related and closely coordinated effort that accomplishes the bulk of the engineering development of avionics systems.

Program Element: #64212F
DOD Mission Area: #223 - Close Air Support & Interdiction

Title: Aircraft Equipment Development
Budget Activity: #4 - Tactical Programs

6. (U) WORK PERFORMED BY: Program management is provided by the Air Force Aeronautical Systems Division and Wright Aeronautical Laboratories, Wright-Patterson Air Force Base, OH. In-house test facilities involved in projects under this program element include the Wright-Patterson Air Force Base, OH; the Air Force Flight Test Center, Edwards Air Force Base, CA; Arnold Engineering and Development Center, Tullahoma, TN; Tactical Fighter Weapons Center, Nellis Air Force Base, NV; and the Armament Development and Test Center, Eglin Air Base, FL. Contractors include McDonnell Douglas Corporation, Long Beach, CA and St. Louis, MO; General Dynamics, Fort Worth, TX; Hughes Aircraft Company, Culver City, CA; B.F. Goodrich, Akron, OH; Sierracin Corporation, Sylmar, CA; Pittsburgh Plate Glass Company, Pittsburgh, PA; Honeywell Incorporated, Minneapolis, MN; Bendix Corporation, South Bend, IN; Goodyear Aerospace Corporation, Akron, OH; and Dunlop Limited, Coventry, England.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: (1926 - Aircraft Windshield Development) - Aircraft Windshield Development, applies the latest technology to achieve bird impact resistance while maintaining high optical quality and light weight. F-111 bird impact resistant windshields have been developed in this project and effort will be concentrated on the F-16, T-38 and F-4 aircraft. In FY 82 this project continued development, test and evaluation of windshield lamination and canopy structures on the F-16, F-111 and T-38. Work on improving the bird-strike impact resistance of the F-4 was begun. FY 83 will be a continuation of efforts on the above aircraft. Plans are also being executed on the F-15 for concerns raised on bird strikes during low altitude operations. FY 84 will concentrate on F-4, F-15 and rainbow effects on B-1B windscreens. All efforts are expected to improve combat capability, pilot safety and reduce cost.

B. (U) Project: (2098 - Landing Gear Development) - Aircraft Accessories Development applies landing gear technological improvements in the areas of high temperature wheels and brakes and carbon disc brakes in an effort to improve performance, decrease acquisition costs, and, reduce operation and support costs. FY 82 efforts were directed to implementing support to the Joint Logistics Commander's work on a domestic source of natural rubber through cultivation of Guayule plants in the southwest U.S. Efforts on standardization of aircraft fasteners continued. Work to develop an isolated hydraulic system for aircraft landing gear to provide use of hydraulic fluids with greater fire retard capabilities. FY 83 will continue in these areas with increased emphasis in the Guayule rubber effort. FY 84 will include the above efforts and add areas devoted towards corrosion control on landing gear, Aircraft Ground Mobility Systems for use of battle damaged runways, and work on electromechanical subsystems used in aircraft.

C. (U) Project: (2377 - Airdrop Systems Support) - Airdrop Systems Support provides the method by which the United States Air Force carries out its responsibilities as executive agent (designated by the Joint Technical Airdrop Group) for development and testing of on-board airdrop systems. Efforts in FY 82 included work on computing air release point parameters on new airdrop subsystems. Support of Military Airlift Command and Army in development of improved airdrop systems. FY 83 and 84 are a continuation of the efforts in the above areas. This is a level of effort program.

D. (U) Project: (2709 - Integrated Turbine Engine Monitoring System) - The Integrated Turbine Engine Monitoring System provides for development of a generic system to monitor real time engine operating data for electronic processing and storage on board the aircraft for inflight readout and post flight review. Outputs will be used to improve maintenance and engine performance data base files and provide flight crews data for inflight operational decisions. FY 82 had no activity in this effort. FY 83 will consist of beginning the conceptual efforts required for RFP and specification generation. FY 84 will be the release of RFP and contract efforts for prototype equipment.

E. (U) Project: (4366 - Integrated Attack Avionics) - Integrated Attack Avionics integrates and tests the latest developments in the avionics/weapons areas to develop interface techniques which will assure optimum weapon delivery in high performance aircraft. This project provides for (a) the feasibility demonstration and qualification testing of a compact airborne video recorder (CAVR); (b) the prototype development and qualification testing of a split screen video compression (SSVC) capability, designed and tested to interface requirements for various applications in tactical aircraft and (c) a feasibility demonstration of solid state color cockpit video sensor (CCVS) capability suitable for tactical aircraft use, with planning and investigation for full scale development, production and aircraft integration. FY 82 was devoted to preliminary activities in development of packaging concepts of commercially available hardware and study of work required to flight qualify such hardware. FY 83 will culminate the FY 82 efforts into contractual actions for prototype hardware to be flight tested and evaluated prior to any production actions. FY 84 will end the T&E effort and provide the data required to go into production and delivery of hardware suitable for Class IV and V modifications to tactical aircraft.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64218F
DOD Mission Area: #223, Close Air Support and Interdiction

Title: Engine Model Derivative Program (EMDP)
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to CompletioN	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	38,510	36,254	13,853	18,867	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Engine Model Derivative Program (EMDP) is aimed at filling a void which existed in the engine management and acquisition process for ten years. This program will conduct efforts to provide improvements in the specification characteristics (i.e., performance, durability/life, reliability/maintainability, and reduced risk of development) of in-service engines or those engines which have passed the equivalent of a military qualification test.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	38,510	10,254	20,511	Continuing	Not Applicable

(U) Changes in funding represent deletion of TF 33 funds as well as funding of higher priority programs. FY 1983 reflects a Congressional add for work on the higher thrust version of the F100 engine.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

5. (U) RELATED ACTIVITIES: For the requisite technology, this program draws gas generator "core" engine technology (high pressure compressor, combustor, and high pressure turbine) from Program Element (PE) 63216F, Advanced Turbine Engine Gas Generator. Fan, low pressure turbine, and limited engine test data are provided by PE 63202F, Aircraft Propulsion Subsystems Integration (APSI). Advanced component technology is also obtained from PE 62203F, Aerospace Propulsion. Other principle inputs including materials processing and component fabrication demonstration come from PE 78011F, Manufacturing Technology Program. Activities conducted by the Navy, National Aeronautics and Space Administration, Army, and the propulsion industry in-house programs also constitute significant sources of technology. The Air Force and Navy have a broad memorandum of understanding for joint cooperative propulsion programs in areas of common interest. Component Improvement Program efforts directed toward engine flight safety problems, service revealed difficulties and the achievement of durability goals also complement the long term EMDP development process.

6. (U) WORK PERFORMED BY: The program is managed by the Aeronautical Systems Division, Deputy for Propulsion, Wright-Patterson AFB, OH. The growth F100 engine program is run by Pratt and Whitney Aircraft, Government Products Division, West Palm Beach, FL. General Electric Company, Evendale, OH is the contractor for the derivative T700.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

Program Element: #64218F
DOD Mission Area: #223, Close Air Support and Interdiction

Title: Engine Model Derivative Program (EMDP)
Budget Activity: #4, Tactical Programs

(U) Project: Engine Model Derivative Program

(A) (U) Project Description: The capability provided by EMDP, when combined with new engine developments, will ensure that the Air Force has propulsion alternatives for near term and far term needs. The only other means today to provide this capability is through full scale weapon system development. The EMDP will conduct the early engineering development leading to a prototype engine. Full scale development will continue in a weapon system development program after validation of the requirement for increase capability.

(B) (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The major efforts in FY 1982 consisted of the T56 and F100 derivative engines. The T56 concluded in FY 1982 with a 600-700 hour durability evaluation. The Navy is now under contract for development of a marinized version of the USAF's X T56-100 to serve as electrical power generators on Spruance class destroyers. The F100 derivative engine, with higher airflow fan, new augmentor continued development and testing. The FY 1982 F100 EMDP program was expanded by a Congressional add of $17.5M to demonstrate a higher thrust F100 engine through core engine testing of higher temperature and accelerated mission testing to demonstrate 4000 cycle durability at the higher thrust levels.

(2) (U) FY 1983 Program: Efforts continue on the derivative F100 engine and the derivative T700 engine development will be initiated. Testing of the higher thrust F100 EMDP engine will be conducted at P&WA/GPD and at AEDC. Flight clearance activities will be conducted in preparation for the NASA F-15/F100 EMDP flight test. Design of the new low pressure turbine (LPT) necessary to drive the higher airflow fan and to meet the EMDP life goals (8,000 TAC cycles for "cold" parts) will be initiated. The T700 EMDP design activity will be initiated, and initial development hardware will be procured.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Efforts will continue on the derivative F100 and T700 engines. Increased life core components from the F100 CIP will be incorporated into the F100 EMDP and extensive durability testing will be started on the final EMDP configuration. A 4,000 cycle durability test of the final configuration will be initiated. T700 EMDP design will be completed and engine hardware will be procured. Core engine tests and a full engine demonstration is planned.

(U) Accelerated Mission Testing (AMT) of the F100 EMDP engine in the final design configuration will begin. The purpose of this test, to be completed in 1984, will be to prove durability at an upgraded operating temperature that could provide a thrust level nominally 15 per cent greater than the F100(3) Component Improvement Program (CIP) which includes a double-pass advanced combustor, single crystal turbine airfoils, and a full life compressor. In addition to these core components, the engine will incorporate an Advanced Augmentor Fuel Management (AFM) system designed to eliminate stall/stagnation, the Digital Electronics Engine Control (DEEC), a prime reliable Main Fuel Pump (MFP) and an increased flow fan. Sea level development testing at Pratt & Whitney will be conducted and altitude development testing at Arnold Engineering Development Center (AEDC) will be resumed in 1983 to finalize the engine control logic prior to flight certification.

Program Element: #64218F | Title: Engine Model Derivative Program (EMDP)
DOD Mission Area: #223, Close Air Support and Interdiction | Budget Activity: #4, Tactical Programs

(U) Continue development of the T700 EMDP that is planned to begin in FY 83. The T700 EMDP is the first phase of development for a higher power (15% over the T700-GE-401) engine for the H-60 helicopter family. The Joint Logistics Commanders indorsed this program in September 1982. Full-scale development of the T700 EMDP is planned to be conducted by the Army. FY 84 tasks include design and analysis, hardware procurement and fabrication, core engine tests, and full engine development tests.

(U) Cost estimates based on contractor proposals and Air Force analysis of the level of effort required.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64220F Title: EW Counter Response
DOD Mission Area: #372 - Escort, Stand-off & Counter C^3 Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	9,165	22,000	34,508	37,252	Continuing	N/A
2066	EF-111A Capability Update	3,065	2,700	18,408	24,252	Continuing	N/A
2687	Operational Flight Trainer	6,100	19,300	16,100	13,000	5,900	60,400

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The EF-111A Tactical Jamming System provides tactical jamming of early warning, acquisition, and ground control intercept radars in support of United States and Allied Tactical Strike Aircraft operations. It

- The EF-111A provides the

- By denying acquisition range, azimuth, and altitude information required by surface-to-air missiles, (SAMs), anti-aircraft artillery (AAA) and airborne interceptors (AI),

- The EF-111A's capabilities will become even more important with the introduction of

- This program provides the research, development, test, evaluation and integration of software and hardware updates to aircraft electronic countermeasures subsyste

It also funds the development of an Operational Flight Trainer to train EF-111A aircrews.

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Program Element: 64220F Title: EW Counter Response
DOD Mission Area: #372 - Escort, Stand-off & Counter C^3 Budget Activity: #4 - Tactical Programs

3. (U) COMPARISON WITH 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	9,165	27,335	22,217		Continuing	N/A
Procurement (Aircraft PE #27252F)	270,600	206,400			37,900	1,077,500

- Congress reduced FY 83 RDT&E funding by $5,335; no rationale was provided.

- FY 84 RDT&E was increased by $6,454 for software and minor hardware improvements to EF-111A electronic countermeasures subsystems and reduced by $2,700 when the Operational Flight Trainer program was restructured after the 15 Jul 82 contract award for a net increase of $3,754.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

PE 27252F		FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Aircraft Procurement:	BP 1100	252,700	203,600	0			1,050,800
Funds	BP 1200				26,700*		26,700
	3010 TOTAL	274,692	236,287	41,357			
Quantities	Proc	12	9	0	0		
	Del	8	9	13	12		
Military Construction, Funds	3300	2,390	9,150	980			11,540
PE 72207F							
Operations and Maintenance (Mod Install)	3400	30,700	54,000	71,500			185,800

*Includes Initial Spares and Simulator

5. (U) RELATED ACTIVITIES:

- (U) Program Element 27252F, EF-111A Squadrons, funds the Class V modification kit procurement and military construction associated with the EF-111A Tactical Jamming System. This program element also procures the second Operational Flight Trainer.

- (U) Program Element 63718F, Electronic Warfare Technology, funds advanced development efforts for a high powered jamming system.

Program Element : 64220F   Title: EW Counter Response
DOD Mission Area: #372 - Escort, Stand-off & Counter C^3 Budget Activity: #4 - Tactical Programs

- (U) Program Element 72207F, Depot Maintenance, funds the installation of the EF-111A Tactical Jamming System.

6. (U) WORK PERFORMED BY: The prime contractor is Grumman Aerospace Corporation, Bethpage, Long Island, New York (airframe and electronics). The principal subcontractors are: Airborne Instruments Labratory, Deer Park, Long Island, New York (ALQ-99 receiver); Raytheon Company, Electromagnetic Systems Division, Goleta, California (ALQ-99 Band 4-9 transmitters and exciters for all bands); American Electronics Laboratories Incorporated, Landsdale, Pennsylvannia (ALQ-99 Band 1 and 2 transmitters); AAI Corporation, Baltimore, Maryland (Operational Flight Trainer). There are ten other contractors associated with this program.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

Project: #2066 EF-111A Capabilities Upgrade This project develops basic software and minor hardware updates to the EF-111A tactical jamming electronic countermeasures subsystems. The hardware and software development efforts are neede FY 82 efforts included software improvements and evaluation and analysis studies to determine potential update improvement areas. FY 83 and FY 84 efforts will continue software improvements as well as development and integration effort, to improve signal processing capability, and jamming techniques generation.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: #2687 Operational Flight Trainer

A. (U) Project Description: The Tactical Air Force requires development of an Operational Flight Trainer to facilitate training of both pilots and electronic warfare officers in a new and unique mission. Requirement for this equipment is supported by absence of available training ranges, transfer of operator duties required in varying mission profiles and restrictions on peacetime flight which preclude realistic operation of electronic warfare equipment. The Operational Flight Trainer will be a two place simulator which will be capable of simulating the Central European radar environment and all flight profiles of the EF-111A.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Contract for development of an Operational Flight Trainer was awarded 15 July 1982 to the AAI Corp., Baltimore, MD.

(2) (U) FY 1983 Program: The Systems Requirement Review was completed in October 1982. Formatting of the computer program documentation and initial submittal of the computer program development specifications were completed. Arrangements were made to provide 20 items of government furnished equipment to the prime contractor. A complete computational system will be delivered which will allow completion of the development prototype site in March 1983. Three incremental preliminary design reviews (PDR) will be held in January, February, and March for the flight, radar, and electronic warfare (EW) subsystems respectively. The system level PDR will be held in April 1983, in conjunction with the mockup review. The instructor operator station design will be completed and hardware released for fabrication in August 1983. The radar subsystem will undergo the first incremental critical design review (CDR) in August, 1983.

Program Element: 64220F | Title: EW Counter Response
DOD Mission Area: #372 - Escort, Stand-off, & Counter C^3 | Budget Activity: #4 - Tactical Programs

(3) (U) FY 1984 Planned Program and Basis for FY 84 RDT&E Request: Incremental CDRs for the flight and EW subsystems will be completed in November 1983. An intensive data search will culminate in an emitter design freeze in December. Fabrication of various subsystems will be accomplished, to include signal generation, ALR-62 Radar Warning Receiver, radar, flight, and EW subsystems. These primary components will undergo subsystem assembly, integration, and test at the prime contractor's plant. Software integration of the flight and radar subsystems will be completed in July, followed by initiation of system level hardware and software integration in September 1984.

(4) (U) Program to Completion: Complete development of the first Operational Flight Trainer and deliver it to Mountain Home AFB, ID in Nov 1985. Begin production of a second Operational Flight Trainer in FY 1985 with delivery to Upper Heyford, England in Nov 1986.

C. (U) Major Milestones:

	Date
TAC ROC No. 315-73	30 Apr 73
Aircrew Training Device Amendment	29 Jul 77
Validate OFT Requirement	31 Jan 78
Contract Award	15 Jul 82
Preliminary Design Review (PDR)	Apr 83
Critical Design Review (CDR)	3 Qtr FY 84
Fabrication	4 Qtr FY 84 - 1 Qtr FY 85
In-plant Test	4 Qtr FY 84 - 3 Qtr FY 85
Exercise Production Option	1 Qtr FY 85
Teardown, Pack, Ship, Install, Test	4 Qtr FY 85 - 2 Qtr FY 86
First Trainer Ready for Training	2 Qtr FY 86
Second Trainer Ready for Training	2 Qtr FY 87

Budget Activity: Tactical Program, #4
Program Element: #27252F/64220F, EF-111A

Test and Evaluation Data

1. (U) Development, Test and Evaluation: The ground test portion of the EF-111A Tactical Jamming System Development, Test and Evaluation began at Grumman Aerospace Corporation, Bethpage, New York, in March 1975. The goal was system integration and acceptable performance for those development efforts directed by Defense System Acquisition Review Council II prior to flight test to ensure that new or modified subsystems met contractural specifications. Tests conducted at contractor facilities under laboratory or mockup conditions included evaluations of the environmental control system, modified electrical power system, antennas and radomes associated with new equipment, reliability, airframe vibration and retained F-111A avionics systems. Air Force software support and fully developed support equipment were not available for this phase due to Defense System Acquisition Review Council II direction. This was based on the cost associated with support equipment development and the need to verify EF-111A effectiveness prior to obligating funds associated with these areas. Peculiar ALQ-99E intermediate level maintenance and software support was provided by the contractor during Development, Test and Evaluation. This affected the quality of information available for the production decision and resulted in continued testing after Defense System Acquisition Review Council III. Specific test and evaluation capabilities built exclusively for the support of EF-111A Development, Test and Evaluation include a System Integration Test Station for software testing and total system integration, a crew station mockup for human factors evaluation of cockpit control and display adequacy, and operator procedures. Government owned facilities used include the National Aeronautics and Space Administration wind tunnels (for aerodynamic loads and flutter tests), the Department of Defense Anechoic Chamber (for electromagnetic interference and compatibility investigation), the Electronic Warfare Ground Simulators (for antenna pattern testing/optimization), the Rome Air Development Center EF-111A antenna pedestal (for antenna pattern testing/optimization), the Air Force Eglin Test Range and the Western Test Range (for ALQ-99E receiver and transmitter performance evaluation). The Grumman Electronic Warfare Test Range was used to obtain broad-based engineering data. Government test facilities and ranges used during Development, Test and Evaluation did not differ significantly from those used during Initial Operational Test and Evaluation. Airborne testing utilized two EF-111A prototype aircraft. Overall air vehicle Development, Test and Evaluation testing was performed from 10 March to 22 June 1977 using an EF-111A prototype modified to the propose structural configuration but without peculiar EF-111A avionics. This testing concluded that a tail fin redesign was necessary. The second EF-111A prototype vehicle was used for contractor avionic system and subsystem Development, Test and Evaluation between 17 May and 30 September 1977. This vehicle differed from the airworthiness vehicle in that all avionics subsystems were installed. System and subsystem components were identical to those intended for use in the production EF-111A except for the ALR-23 Infrared Warning Receiver which was deleted in the production configuration. The configuration of other systems evaluated during Development, Test and Evaluation have been altered slightly from the original configuration as a result of corrections to deficiencies identified during this and other phases of the flight test. Specific components added to the modified F-111A airframe included the ALQ-99E Jammer Subsystem, the ALR-62 Terminal Threat Warning System, the ALQ-137 Self Protection System, a new Environmental Cooling System, revised right seat aircrew station, and updated generators from the F-14 aircraft.

Budget Activity: Tacticial Programs, #4
Program Element: 64220F - Tactical Jamming System -

2. Operational Test and Evaluation: The Initial Operational Test and Evaluation of the EF-111A Tactical Jamming System was conducted October 1977 - April 1978 by the Air Force Test and Evaluation Center. The EF-111A Initial Operational Test and Evaluation Final Report was published in August 1978. The aircraft was fli ht-tested in the barrier/standoff and penetration/escort mission roles. The close air support and battlefield i diction mission roles were evaluated at the Air Force Electronic Warfare Evaluation Simulator. The following summary of the Initial Operational Test and Evaluation results and conclusions. The EF-111A's performance in standoff/barrier role was determined to be excellent. The EF-111A's performance in the penetration/escort role rting deep strikes was determined to be satisfactory to excellent. When supporting battlefield interdiction missi at the Air Force Electronic Warfare Evaluation Simulator the EF-111A's performance was satisfactory. In additi the EF-111A's jamming effectiveness, the Initial Operational Test and Evaluation included evaluation of the ALQ-137, human factors, aircraft performance, internal Electromagnetic Interference/Electromagnetic Compatibi. xternal Electromagnetic Interference/Electromagnetic Compatibility, and software. Results in each of these ar are: the ALQ-137 performance was satisfactory; the single Electronic Warfare Officer concept was validated. The displays, controls, and cockpit configuration were determined to be satisfactory; however, some man/machine interface software improvements were recommended. Aircraft performance was satisfactory. Internal Electromagnetic Interference/Electromagnetic Compatibility was undetermined due to the ALR-62 not being in a configuration for testing. External Electromagnetic Interference/Electromagnetic Compatibility was minimal and determined to be satisfactory. The ALQ-99E and ALQ-137 software performance was satisfactory. Reliability was evaluated in two areas: Mission Completion Success Probability and hardware reliability. Mission Completion Success Probability was satisfactory. Peculiar subsystem reliability was satisfactor
No significant degradation occurred in the systems common to the F-111A. Maintainability was evaluated in terms of Maintenance Man Hours per Flying Hour values measured in a sterile test environment, using contractor support, were satisfactory;
The Logistics Composite Model was used to estimate maintenance manpower requirements for the current and a mature system. They were satisfactory. Software supportability was determined to be deficient, but correctable to satisfactory. Due to the number and possible impact of deficiencies identified in Initial Operational Test and Evaluation, the Office of the Secretary of Defense directed the Air Force to complete a suitability demonstration to provide additional decision data. The additional operational testing of the EF-111A Tactical Jamming System was conducted as a Follow-on Test and Evaluation managed by Air Force Test and Evaluation Center. The primary purpose of the Follow-on Test and Evaluation, as directed in a 10 February 1979 Office of the Secretary of Defense memo to the Secretary of the Air Force, was to evaluate system reliability and maintainability using Air Force maintenance personnel. Flight testing was initiated at Mountain Home Air Force Base during April 1979 and was planned to end in October 1979. Reliability data was collected during the entire test. Maintainability data was gathered from 1 June through 31 October 1979, as the period 18 April through 31 May 1979 was used for training Air Force maintenance personnel. Although the test was primarly designed as a suitability assessment, some effectiveness testing was conducted. Laboratory testing to compare the effectiveness of the ALQ-99E and the ALQ-137 in performing the self-protection role was conducted at the Air Force Electronic Warfare Evaluation Simulator. Similar testing with the ALQ-99E and ALQ-137 installed in the prototype

Budget Activity: <u>Tactical Programs, #4</u>
Program Element: <u>64220F - Tactical Jamming System -</u>

EF-111A test aircraft was also conducted against radar simulators on the Nellis ranges. Flight testing was also conducted to evaluate the performance of the ALR-62 in an internal (ALQ-99E/ ALQ-137) and external (F-4 aircraft with ALQ-119 self protection electronic countermeasures pods) electronic countermeasures environment. Flight testing was completed on 14 November 1979. The Air Force Electronic Warfare Evaluation Simulator tests incurred delays due to test system problems, and testing was completed 9 May 1980. The Defense Systems Acquisition Review Council III memorandum established a flight test goal of 150 flight test hours for the collection of Reliability and Maintainability data. Final flight test results were: 85 missions flown out of 89 scheduled; 261.4 flight test hours accumulated for reliability data; 197.6 flight test hours accumulated for maintainability data; a 5.0 hour Mean Flying Hours Between Failure was demonstration for the ALQ-99E (The threshold was 3.0 hours.); Mean Time To Repair for the ALQ-99E was measured at 3.1 hours. However, due to to the high skill level of the test team maintenance personnel, a projection for a normal operational unit with some personnel in a training status was made. The projection indicated the ALQ-99E Mean Time To Repair could be 4.4 hours (The Follon-on Test Evaluation threshold was 6.0 hors). The ALQ-137, which experienced two failures in 121 flying hours for an Mean Flying Hours Between Failure of 60.5 hours, was evaluated as satisfactory even though no Follow-on Test and Evaluation threshold has been established. False removal rate of line replaceable units resulting from built-in-test/built-in-test equipment was 19.2 percent (The Follow-on Test and Evaluation threshold was 25 percent.). The measured Maintenance Man Hours per Flying Hour was 22.6. Since these results were obtained in a sterile test environment, a projection was made to estimate the Maintenance Man Hours per Flying Hour for a mature system. This estimate was close to the current Maintenance Man Hours per Flying Hour of the F-111A and was determined to be satisfactory. Improvements to correct ALQ-99E software deficiencies discovered during Initial Operational Test and Evaluation were evaluated and determined to be satisfactory. Corrections to the deficiencies discovered during Initial Operational Test and Evaluation, such as ALQ-99E internal Electromagnetic Interference, ALQ-99E Band 4 transmitter reliability and ALQ-99E power interrupt, were evaluated and determined to be satisfactory. The ALR-62 flight testing showed system operation to be considerably improved when compared to the system's performance during Initial Operational Test and Evaluation. The system experienced [

was evaluated as satisfactory even though no Follow-on Operational Test and Evaluation threshold was established. The test report was published in February 1980. Because all of the data from the Air Force Electronic Warfare Evaluation Center testing was not available at the time of publication, some of the Air Force Electronic Warfare Evaluation Center test results were published as an addendum to the final report in August 1980. The completion of Phase I Follow-on Test and Evaluation using production aircraft was to be accomplished by Air Force Test and Evaluation Center between December 1981 and August 1982. This testing was accomplished to confirm that adequat deficiency corrections have been installed in production aircraft and to further assess the operational suitability of the aircraft. Emphasis was placed on evaluating equipment which had not previously been available for testing, such as the intermediate level automatic test equipment. Data are being analyzed and the final report is due in January 1983.

Budget Activity: Tactical Programs, #4
Program Element: 64220F - Tactical Jamming System

For the EF-111A Operational Flight Trainer, initial testing will be accomplished under a combined Development, Test and Evaluation/Initial Operational Test and Evaluation concept. Air Force Test and Evaluation Center will conduct the operational testing. Testing will consist of a combined Development Test and Evaluation/Initial Operational Test and Evaluation at the contractor's facility and a dedicated Initial Operational Test and Evaluation at the on-site location (Mountain Home Air Force Base, Idaho). The Initial Operational Test and Evaluation will consist of evaluations in the following areas: training capability of the Operational Flight Trainer for all tasks assigned to it within the training program; instructional capability of the Operational Flight Trainer instructor-operator station; software effectiveness to include the adequacy of computer resources for developing mission scenarios, usability and maintainability, availability aeronautical tasks; the capability to accomplish scheduled missions and the impact of reliability, maintainability and logistics supportability on availability for training. The on-site test will be conducted in a realistic operational environment (i.e., use of Operational Flight Trainer to train operational crews using typical training missions in the operational facility). Testing will be conducted with contractor provided maintenance and support equipment while Air Force observes "over-the-shoulder". The Air Force will use computer resources to generate the mission scenarios used to train aircrews in the Operational Flight Trainer.

Test Reports:

- ADTC Test Report TR-78-56 Vol I & II
- ADTC EF-111A Tac Jam System Evaluation August 1978
- AFTEC Final Report EF-111A Tac Jam System Evaluation Initial OTE August 1978
- AFTEC Final Report EF-111A Tac Jam System Evaluation Followon T&E (Phase I) February 1980
- AFTEC Final T&E Report due in January 1983

3. (U) System Characteristics: Significant EF-111A performance parameters with Decision Coordinating Paper threshold values shown below:

A. Characteristics	DCP Threshold	Achieved Values	Testing Accomplished During	By
Maximum sustained air speed at Sea level (Mach Number)	.91	1.07	Final Operational Test and Evaluation	Air Force Test and Evaluation Center
Unrefueled Loiter time, Mach 0.5 at 17,000, 150 Nautical Miles radius (hours)			Final Operational Test and Evaluation	Air Force Test and Evaluation Center
Unrefueled mission radius strike mission Mach 0.84 (Nautical Miles)	765	770	Final Operational Test and Evaluation	Air Force Test and Evaluation Center

Budget Activity: Tactical Programs, #4
Program Element: 64220F - Tactical Jamming System

B. ALQ-99E Jammer Subsystem

Intercept and identify all thrust radar signals in all bands second			Final Operational Test and Evaluation	Air Force Test and Evaluation Center
Jammer spot per transmitter			Final Operational Test and Evaluation	Air Force Test and Evaluation Center
Accuracy of measuring direction of arrival of signals				
Low Band			Final Operational Test and Evaluation	Air Force Test and Evaluation Center
High Band			Final Operational Test and Evaluation	Air Force Test and Evaluation Center
Reliability Mean Flying Hour Between Failure (hours)	3.0	12.5	Final Operational Test and Evaluation	Air Force Test and Evaluation Center
Maintainability Mean Time To Repair, organizational level (hours)	6.0	1.4	Final Operational Test and Evaluation	Air Force Test and Evaluation Center

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64222F
DOD Mission Area: #242 - Theater Wide Nuclear Warfare

Title: Nuclear Weapon Support
Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

PROJECT NUMBER	TITLE	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	1,694	2,298	1,972	1,991	CONTINUING	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Provides funds for salaries of the Air Force Weapons Laboratory cadre of civilian nuclear weapon specialists to provide technical guidance to the Department of Energy, and direction to the North Atlantic Treaty Organization and Canadian Armed Forces to fulfill United States Air Force responsibility related to the development and support of nuclear weapon systems. Includes funds to perform Air Force gravity nuclear weapon development. Supports Strategic Air Command Required Operational Capability 16-71 (Peacekeeper), 12-76 (Air Launched Cruise Missile), 6-76 (B61 Tactical Bomb), 6-69 (B83 Modern Strategic Bomb), and Tactical Air Force Statement of Need 304-77 (Ground Launched Cruise Missile).

3. (U) COMPARISON WITH FY 83 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	1,694	2,298	2,049	-	CONTINUING	N/A

4. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Acquisition *						
B83 Modern Strategic Bomb						
B61 Tactical Bomb						
Maintenance and Evaluation *						
B83 Modern Strategic Bomb						
B61 Tactical Bomb						

*Department of Energy Funded

Program Element: # 64222F
DOD Mission Area: #242 - Theater Wide Nuclear Warfare

Title: Nuclear Weapon Support
Budget Activity: #4 - Tactical Program

5. (U) RELATED ACTIVITIES: Activities which are related to the warhead development in this program element (PE) include PE 64312F (Peacekeeper), PE 64361F (Air Launched Cruise Missile), PE 64362F (Ground Launched Cruise Missile), PE 63319F (Advanced Cruise Missile Technology). Activities related to nuclear weapon carrier modification/update include PE 11113F (B-52 Offensive Avionics System), PE 11115F (FB-111B/C), PE 11118F (Short Range Attack Missile), PE 11213F (Minuteman Squadrons) PE 11212F(TITAN Squadrons), PE 64226F (B-1B), and PE 11126F (B-1B).

6. (U) WORK PERFORMED BY: Work is managed and primarily performed by the Air Force Weapons Laboratory, Kirtland AFB, N.M. Flight testing in conjunction with the B83 and B61 programs is performed at the Air Force Flight Test Center, Edwards AFB, CA, employing both Air Force Systems Command and Strategic Air Command aircraft assets. An Air Force Weapons Laboratory operating location at Ramstein Air Base, Federal Republic of Germany, monitors all work on the trilateral Tornado aircraft.

7. (U) Nuclear Weapon Support(PROJECTS LESS THAN $10 MILLION IN FY 1984):

A. (U) Project Description: Nuclear weapon development, modification, and life cycle support is a joint Department of Defense and Department of Energy program. Air Force activities which support this dual agency program and those which fulfill unique Air Force nuclear weapon responsibilities are performed in this program element.

Nuclear weapons development responsibilities include acting as the Air Force technical manager during the development and modification of nuclear weapon assets, and in the case of gravity bombs, acting as the system program office during weapons development (B83, B61-3/4) and major modification (B61, B28).

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Nuclear weapon development support continued. The DOD/DOE design and cost report for the Peacekeeper warhead was completed and published and engineering development was initiated. Deployment of W78 on Minuteman III and B61-3,4 tactical bombs continued.

(2) (U) FY 1983 Program: Nuclear weapon support continues. B83 development flight testing is completed. First wing of B-52 aircraft equipped with Air Launched Cruise Missiles becomes operational. Deployment of the W78 on Minuteman III is completed. Upgraded aircraft monitor and control units are deployed on B-52 and FB-111 forces. B83 and W84/Ground Launched Cruise Missile first production occurs. B61-3, 4 deployment and engineering development of the W87/Peacekeeper continues.

Program Element: #64222F
DOD Mission Area: Theater Wide Nuclear Warfare, #242

Title: Nuclear Weapon Support
Budget Activity: Tactical Program, #4

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Nuclear weapon carrier/compatibility and support equipment programs include performing the system related technical safety evaluations required to nuclear-certify new/modified Air Force weapon systems. Systems presently under study include the B-52 Offensive Avionics System/Air Launched Cruise Missile System, the F-16 fighter, and the North Atlantic Treaty Organization trilateral aircraft. Design responsibility for Air Force nuclear weapons loading and handling shapes, and for flight and load crew electronic simulators resides in this program element. Presently under development are the B83 loading and handling trainers, and the F-16 nuclear weapon store simulator. Nuclear weapon cargo tiedown testing in support of the Military Airlift Command for nuclear weapon logistic movements is also performed.

Nuclear loading, delivery, and transport technical orders for all Air Force and North Atlantic Treaty Organization air delivered nuclear weapons are written, published, and maintained in this program element. Funds are provided by the Air Force Logistics Command and Foreign Military Sales programs on a cost reimbursable basis.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64223F
DOD Mission Area: #223, Close Air Support and Interdiction

Title: Alternate Fighter Engine
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	36,869	84,000*	132,059	33,998	18,154	303,080

*(U) This amount reflects a reduction of $10M in FY 83 as an administrative reduction for a directed reprogramming action and once actual sources are identified, this amount will be restored to this program.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Provides funds to extend the previous, highly successful efforts on the F110 (previously F101 Derivative Fighter Engine (DFE)) under PE 64218F, Engine Model Derivative Program (EMDP), to complete full scale development. Also qualifies the Digital Electronic Engine Control and the gear type main fuel pump for the F100 Engine.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

34,869	94,125	83,125		TBD	212,119

(U) Additional funds programmed in FY 84 to integrate the F110 and the F100 Digital Electronic Engine Control into both the F-15 and F-16.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable. Incremental funds required to implement competition included in F-15 (PE 27130F) and F-16 (PE 27133F)

5. (U) RELATED ACTIVITIES: This program continues the development of the F101 DFE which was initiated under Program Element 64218F, Engine Model Derivative Program (EMDP). The EMDP on the F101 DFE was conducted under a Memorandum of Understanding with the Navy. The Navy is conducting flight tests in an F-14 in FY 1983.

6. (U) WORK PERFORMED BY: The program is managed by the Aeronautical Systems Division, Deputy for Propulsion, Wright-Patterson AFB, OH. The F110 program is being conducted by the General Electric Company, Evendale, OH. The F100 program is being conducted by Pratt & Whitney, West Palm Beach, FL.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: Alternate Fighter Engine

Program Element: #64223F Title: Alternate Fighter Engine
DOD Mission Area: #223, Close Air Support and Interdiction Budget Activity: #4, Tactical Programs

A. (U) Project Description: The F110 was one of the first programs to be included in the Engine Model Derivative Program (EMDP). The F110 is a fighter version of the B-1 engine, the F101. It consists of the same core as the F101 with scaled technologies of the F404 in the fan and augmentor. The three year EMDP effort on the F110 was completed in FY 1981 with the F-16 and F-14 flight tests. The test results to date of the F110 have been very successful and have confirmed the design emphasis on reliability and durability. The flight tests in F-16 and F-14 test beds have confirmed the altitude tests at the Arnold Engineering Development during the technology demonstration meets or exceeds predictions. In FY 1982 this Program Element was initiated to provide a transition to full scale development and to maintain the option of the F110 as a competitive alternative for a mid-to-late eighties application. In FY 1982, the full scale development of the Digital Electronic Engine control (DEEC) for the F100 engine was initiated. The DEEC provides enhanced operability and substantially reduced support costs as well as deleting the requirement to trim the F100 engine.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The engineering efforts on the F110 focused on system optimization. The test program included 150 hours of testing at the Arnold Engineering Development Center and 400 hours of accelerated mission testing. Component testing of items such as the fan, turbine, and fuel control were included. Long lead for additional test hardware was procured as part of the FY 1982 program. The production configuration of the F110 was defined resulting in a common engine design which can be applied to the F-15, F-16, and F-14 aircraft.

(2) (U) FY 1983 Program: The FY 83 portion of the F110 program is heavily hardware oriented. By the FY 1982 effort (transition phase), the common engine design effort was completed and the redesigned hardware to support the FY 19 83-1984 FSED was on order. Also, testing was completed for ingestion capability and operability reliability improvements brought about by minor controls and augmentor changes. During the latter part of FY 1983 this hardware will be delivered. In addition, new rotors will be procured in FY 1983 and delivered in early FY 1984. This engine will serve as the engine official qualification vehicle.

(U) Full scale development of the Digital Electronic Engine Control (DEEC) for the F100 engine will also be continued to provide enhanced operability and reduced support costs. F-16 flight testing in FY 1983 will evaluate augmentor steady state and transient envelope definitions. Aircraft accelerations and climbs will be evaluated as well as air starts in both the primary and back up mode. The productionized design will undergo tests at Arnold Engineering Development Center (AEDC) and flight tests later in FY 1983.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The F110 FSED will contain over 750 test hours, composed of accelerated mission tests (AMT) and operability/mechanical performance testing. There will also be additional altitude test effort and numerous rig tests to verify structural/mechanical characteristics. Official qualification will be completed in September 1984. F-16/F-15 flight testing will be supported with engineering and

hardware throughout FY 1983 and 1984. Qualification of the F100 DEEC will be completed with additional AEDC tests and operational evaluation. Substantial effort is planned for the integration of the F100 DEEC into the F-16/F-15 and the F110 into the F-15.

(4) (U) Program to Completion: Remaining efforts focused on integration and flight tests.

C. (U) Milestones: Not Applicable.

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FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64231F   Title: C-17 Program
DOD Mission Area: #261 - Intertheater Airlift   Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0	60,000*	26,833	32,633	TBD	TBD

*No FY 1983 RDT&E requested however, $60.0 million appropriated for C-17 in FY 83 to accelerate RDT&E on C-17.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Airlift is required to project and sustain combat forces in a time urgent manner. Specific tasks associated with the airlift mission area include deployment, employment (airland, airdrop and extraction), sustaining support, retrograde, and combat redeployment. Additional airlift capability is needed for rapid intertheater deployment of combat forces to support national objectives and for timely intratheater movement to meet forward area mobility requirements. Airlift is vital to meet the mobility requirements for a NATO or Korean conflict as well as for a Rapid Deployment Force tailored to respond to worldwide contingencies. The C-17 program addresses those needs as well as providing a candidate for eventual replacement of C-130As and C-141s in the 1990s.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: Not applicable.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Procurement (Aircraft)					TBD	TBD

5. (U) RELATED ACTIVITIES: The Air Force is also pursuing near-term programs to provide additional capability to airlift cargo during periods of national emergency. These programs include procurement of 50 C-5B aircraft under P.E. 41119F and 44 KC-10s under P.E. 27222F. These programs are in conjunction with C-17 acquisition provide a balanced overall program for additional airlift. They will meet the Congressionally Mandated Mobility Study recommended airlift capability.

Program Element: #64231F　　　　　　　　　　　　Title: C-17
DOD Mission Area: #261, Intertheater Airlift　　　　　　Budget Activity: # 4 - Tactical Programs

6. (U) WORK PERFORMED BY: A Program Office is established at the Aeronautical Systems Division of Air Force Systems Command at Wright-Patterson Air Force Base, Dayton, OH. McDonnell-Douglas Corporation has been selected as the prime contractor. A low-level development contract was awarded to McDonnell Douglas in July 1982. The Air Force Flight Test Center and the Air Force Test and Evaluation Center will conduct developmental and operational flight testing in the Full Scale Development Program.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not applicable.

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: C-17 (Single project in program element).

A. (U) Project Description: This program element provides for development of the C-17, an aircraft capable of carrying outsized cargo over intercontinental distances into small, austere airfields. The C-17 is a major initiative to improve our rapid deployment capability and also provide the lift capability to move heavy mechanized Army/Marine Corps equipment in-theater as well as a potential replacement for aging C-141 and some C-130 aircraft in the 1990s.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: A contract for low level development of the C-17 design was awarded to McDonnell-Douglas in July 1982. Work began on wind tunnel testing and logistic support analysis of the C-17 design. Specific areas of concern were: low speed powered lift technology, full core thrust reverse, winglet design, and cargo compartment workload.

(2) (U) FY 1983 Program: Continue wind tunnel work on wing design and initial work on dual cockpit configuration for two-man cockpit. Integrate the cargo area and cockpit area mockups.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The FY 1984 request is to continue low level development on the C-17 design which began in FY 82. Wind tunnel work on air loads will provide data for final wing design. Logistic support analysis software will be developed to allow real time feedback of support data during the development and test phases of the program. Cost estimates are based on program office analysis of the C-17 contract costs. FY 84 work will lead to a development/production decision during FY 84.

(4) (U) Program to Completion: Funds will be used for completion of production design effort, assembly and test of durability/static test articles, completion of design specifications on procurement items and completion of support equipment design. Funds will also be used for completion of subsystem

Program Element: #64231F — Title: C-17 Program
DOD Mission Area: # 261, Intertheater Airlift — Budget Activity: #4 - Tactical Programs

and component development and flight simulator testing, tooling and parts fabrication. Manufacturing assembly, flight test and systems evaluation will be completed on the Full Scale Development flight test articles.

C. (U) Major Milestones:

Milestones	Dates
1. Contract Award	July 1982
2. Initiate Full Scale Development	FY 1985
3. First Flight	FY 1988
4. Initial Operational Capability	FY 1991

BUDGET ACTIVITY: Tactical Programs, #4
PROGRAM ELEMENT: 64231F, C-17 Program

Test and Evaluation Data

1. (U) Development Test and Evaluation:

(U) Preliminary wind tunnel testing will be conducted during the low-level development phase of the program. Major test phases will be development ground testing, combined development test and evaluation (DT&E)/initial operational test and evaluation (IOT&E), dedicated IOT&E, post-DSARC DT&E, and production acceptance test and evaluation. DT&E will be conducted to assist engineering deisgn and development, to verify accomplishment of specification requirements, to characterize system performance, and to insure critical issues have been sufficiently resolved to permit a rate production decision at Milestone III. DT&E/IOT&E will be conducted using one full-scale development (FSD) aircraft and two-to-four production aircraft. These aircraft will be tested at government test sites except for the first flight. Initial airworthiness testing will be conducted at Edwards AFB, CA, under a combined test force with the Air Force Flight Test Center (AFFTC) taking the lead in DT&E. Development tests include stability, control, and performance as well as reliability, maintainability, and availability.

2. (U) Operational Test and Evaluation:

(U) Initial testing will be accomplished under a combined development test and evaluation/initial operational test and evaluation (DT&E/IOT&E) concept. Air Force Test and Evaluation Center (AFTEC) will take the lead in operational testing which will be conducted by a combined test team with AFTEC, Air Force Flight Test Center, US Army, and US Marine Corp participation. Testing will be conducted under day/night adverse weather conditions and will consist of evaluation in the following areas: Ground operations at both a main operating base (MOB) and a small, austere airfield (SAAF) to include quick reaction capability, quick turnaround time, and ground handling characteristics and procedures; inter/intratheater airland/airdrop missions to include normal (such as takeoff, climb, cruise, descent, approach and landing), as refueling, aeromedical evacuation, formation, low-level, and airdrop operations; crew/system interface; compatibility/interoperability with elements of the Air Force airlift system and with other government agencies and forces of the Army and NATO; training requirements and concepts; operational assumptions used to project service life; survivability, software effectiveness, usability, and maintainability; reliability, maintainability, availability, and logistics supportability; and operating and support cost elements of the life cycle cost model. In addition, a minimum of five aircraft months of dedicated IOT&E will be conducted to assess unique IOT&E objectives. These tests will be conducted in a realistic operational environment (i.e., deployment for a minimum of one or two months to an operational MAC base (TBD) where composite operational missions will be flown into and from MAC and Army bases). Testing will be conducted using Air Force "hands-on" maintenance to the maximum extend feasible.

3. (U) Systems Characteristics:

(U) System performance, reliability, maintainability, and availability characteristics are specified in the contract with McDonnell Douglas Corporation.

C-17 PHYSICAL CHARACTERISTICS/PERFORMANCE:

Length	171'
Wingspan	165'
Height	54'
Cargo Compartment Size (LxWxH)	83.8'x18.0'x12.3'
Number of Pallets	16-18
Max Takeoff Gross Weight (2.25 g)	570,000 lbs
Critical Field Length @ Max TOGW	7600'
Max Allowable Cabin Load (2.25 g)	172,200 lbs
Landing Distance at Max ACL (SL 90° Over 50' Obstacle)	3000'
Range at Max ACL	2400 NM
Airdrop Capability	102 paratroopers
Airdrop and/or LAPES Capability	55,000 Lb Single Platforms Outsize Vehicles
Ground Flotation	LCN 40 Operate on Semi-Prepared Surfaces
Ground Maneuvering	3-Point Star Turn in 80'
Engine Thrust (SL Std Day)	37,000 lbs
Cruise Speed	.78 Mach (456 KTAS) (Jet Speed)
Approach Speed (Max ACL)	116 knots (Turboprop Speed)
Maintenance Manhour per Flight Hour	18.6
Mission Completion Success Rate	93%

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64247F
DoD Mission Area: #225, Air Warfare Suppo.c

Title: Modular Automatic Test Equipment (MATE)
Budget Activity: Tactical Programs, #4

1. (U) RESOURCES: (PROJECT LISTING) ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	20,224	34,580	16,744	10,034	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Previous and current methods used to specify, design, build and support automatic test systems have resulted in a proliferation of equipment, inadequate operational reliability and supportability and excessive life cycle costs. Aircraft availability (force readiness) has suffered because of malfunctioning automatic test equipment at all levels of maintenance. The Modular Automatic Test Equipment (MATE) program has developed a set of guides which delineate a standard architecture and a management system for automatic test system (ATS) acquisition and support that will establish a framework for the acquisition and support of future Air Force automatic test systems.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

20,224	34,580	17,578		Continuing	Not Applicable

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

A-10 INS IATS	FY 1982 Estimate	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Procurement* (Aircraft)	17,300	20,000	0	0	0	37,300
(Quantity)	(13)	(13)				(26)

27131F

* includes initial spares

5. (U) RELATED ACTIVITIES: The Navy assigned a full time representative to the MATE Program Office in early 1979 to make sure MATE stays attuned to their needs. The Navy developed built-in test design guides and the fault isolation/fault detection work being done at the Air Force Rome Air Development Center will provide a basis for decisions concerning the partitioning of test functions between the ATS and built-in test equipment. Program Element (PE) 27131F will provide funds for procurement of up to 26 A-10 INS automatic test equipment stations. Other related program elements include: PE 62204F, Aerospace Avionics, Project No. 2003, Avionics System Design Technology, and Project No. 6069, Electronic Device and Circuit Technology; PE 63253F, Advanced System Integration Demonstration (PAVE PILLAR); PE 64219F,

Program Element: #64247F
DoD Mission Area: #225, Air Warfare Support

Title: Modular Automatic Test Equipment (MATE)
Budget Activity: Tactical Programs, #4

Integrated Digital Avionics; PE 64201F, Project No. 2560, JOVIAL Language Control Facility, and Project No. 2297, Software and Computer Standardization. To prevent duplication all cognizant Army, Navy and Air Force organizations are supplying inputs to reviews of the MATE program and guides. The MATE Program Office supports the Joint Logistic Commander's (JLC) Panel on Automatic Testing as funds and personnel permit.

6. (U) WORK PERFORMED BY: This program is being implemented by the Support Equipment Systems Program Office of the Aeronautical Systems Division at Wright-Patterson AFB, OH. Supporting laboratories are the Air Force Avionics Laboratory, located at Wright Patterson AFB, OH, and the Rome Air Development Center at Griffiss AFB, NY. The system definition contractors were the Sperry Corporation, Great Neck, Long Island, NY (winner of FSD contract); the Westinghouse Electric Company, Hunt Valley, MD; and a team consisting of Technology Development Corporation, Arlington, TX, and the Emerson Electric Company, St Louis, MO.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: N/A

8. (U) MODULAR AUTOMATIC TEST EQUIPMENT (Single Project over $10M in FY1984):

A. (U) Project Description: Implementation and use of the MATE system as defined in the guides will result in automatic test systems which meet Air Force readiness requirements and standard interfaces. This will assure adequate support for our forces and, at the same time, simplify the support of automatic test systems and control proliferation of hardware and software at both the module and weapon system levels. The first applications of the Modular Automatic Test Equipment system will be the Intermediate Automatic Test System (IATS) for the A-10 Inertial Navigation System (INS) and the Depot Automatic Test System for Avionics (DATSA). The acquisition of these automatic test equipment systems is being supported as part of the Modular Automatic Test full scale development program.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Continued full scale development and test of the MATE system and its application to the A-10 Inertial Navigation System (INS) test system. Began replacement of the Depot Automatic Test System for Avionics (DATSA). A new program element number was assigned in FY 1982 to reflect the full scale development phase of the MATE program. The funding for this program was previously shown in PE 63247F, Modular Automatic Test Equipment.

(2) (U) FY 1983 Program: Continue full scale development of the MATE system and the A-10 INS IATS. Begin deliveries and operational testing of the A-10 INS IATS. Continue replacement of the DATSA to support continuing depot level workloads on C-141, F-111, F-4, F-105, and F-106 aircraft.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Continue full scale development of the MATE system. Complete development, deliveries and operational testing of the A-10 INS IATS. Begin deliveries of the DATSA. Plan for development and initial implementation of an organic Air Force capability to qualify MATE hardware and software for application to future Air Force automatic test systems.

Program Element: #64247F
DoD Mission Area: #225, Air Warfare Support

Title: Modular Automatic Test Equipment (MATE)
Budget Activity: Tactical Programs, #4

4. (U) Program To Completion: Complete technical support for the acquisition and installation of the DATSA. Establish an institutional framework for the Air Force to continue the evaluation and application of the Modular Automatic Test Equipment concept. This is a continuing program.

C. (U) Major Milestones: N/A

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64249F — Title: Night/Precision Attack
DOD Mission Area: #223, Close Air Support and Interdiction — Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	84,272	99,867	89,892	96,388	62,173	516,298
2693	Low Altitude Navigation and Targeting Infrared Systems for Night (LANTIRN)	84,272	99,867	89,892	96,388	62,173	516,298

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The threat by the enemy's formidable armored and air forces, especially of the Warsaw Pact against the North Atlantic Treaty Organization (NATO), has increased in the past few years and is projected to become stronger in both quantitative and qualitative terms. Enemy armor, equipped with night vision capability and accurate laser ranging systems, has been combined with new hardware, training and operational doctrine to assure a continued enemy thrust during night and adverse weather conditions. Successful interdiction and close air support missions against this projected threat require accurate target acquisition and weapons delivery. Even though target acquisition, laser designation and attack capability currently exist for day visual conditions, serious deficiencies occur when these same tasks are required to be performed during night and under conditions of reduced visibility. The need is well documented in Tactical Air Forces Statement of Operational Need 302-81, Night Attack Capabilities. The LANTIRN program responds to that need by providing the capability to conduct close air support and interdiction missions at night and under the weather for F-16, A-10 and the planned dual role fighter. In addition to the capability for night attack, LANTIRN fills the need for laser designator to deliver precision laser guided munitions.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
RDT&E	87,271	103,758	93,799		102,654	504,600
(Quantity)			(4)			(4)
Procurement (Aircraft)	5,000	15,400	26,200		1,293,400	1,335,000
(Quantity)					(306)	(306)

(U) EXPLANATION OF CHANGES FROM FY 1983 DESCRIPTIVE SUMMARY:

- FY 1983 RDT&E reduced $3.758 million by Authorization Conference
- Total RDT&E cost estimated increased $11.7 million in outyears as a result of depot support equipment hardware and software tasks being identified as development versus production tasks and adjustments associated with a recent Independent Cost Analysis.

Program Element: #64249F | Title: Night/Precision Attack
DOD Mission Area: #223, Close Air Support and Interdiction | Budget Activity: #4, Tactical Programs

- Total procurement increased $2086.3 million as a result of total quantity buy increasing from 304 to 724 pod sets

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

		FY 1982	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Pod Procurement (Aircraft):							
Funds	(PE 28031F)	5,000				0	6,000
	(PE 27249F)		15,700	4,500	201,300	3,047,100	3,274,300
Quantities					(4)	(720)	(724)

5. (U) RELATED ACTIVITIES: LANTIRN workload evaluations are being accomplished using an A-10 testbed aircraft at Edwards AFB. This effort is managed by the A-10 program office at Wright-Patterson AFB and is closely monitored by the LANTIRN program office. Collection of a diverse high quality Forward Looking Infrared (FLIR) data base for evaluating target recognizer performance is planned by the Avionics Laboratory at Wright-Patterson AFB as an FY 1983 effort. The Avionics Laboratory is also managing an advanced fighter technology program employing the F-16 with FLIR mounted internally in the left strakelet position. The current Navy F/A-18 FLIR pod has been funded for long lead procurement in anticipation of first lot deliveries commencing late FY 83. Automatic target recognizer technology, which was transferred to advanced development under PE 63249F in FY 82, will be continued in that program element until the technology is demonstrated to be sufficiently mature. The terrain following modifications of the APG-66 radar in conjunction with B-1B radar development efforts are being evaluated by Aeronautical Systems Division for possible application to F-16 navigation.

6. (U) WORK PERFORMED BY: The LANTIRN program office, Aeronautical Systems Division, is located at Wright-Patterson Air Force Base, OH. LANTIRN prime contractor is Martin Marietta, Orlando, FL. Major subcontractors include Texas Instruments of Dallas, TX for terrain following radar; Hughes Aircraft Corporation of Canoga Park, CA for missile boresight correlator and automatic target recognizer; Delco Electronics of Milwaukee, Wisconsin for Military Standard 1750 computers.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: 2693 LANTIRN

A. (U) Project Description: The Low Altitude Navigation and Targeting Infrared System for Night (LANTIRN) will provide a capability for low altitude precision attack during night and other than optimal weather conditions in air-to-surface interdiction and close air support missions. LANTIRN consists of a navigation pod, a targeting pod and associated integration with aircraft head-up and head-down displays.

Program Element: #64249F | Title: Night/Precision Attack
DOD Mission Area: #223, Close Air Support and Interdiction | Budget Activity: #4, Tactical Programs

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Fabrication of navigation and targeting pods was begun in preparation for a July 1983 start of flight test. Digital scan converter development was completed and tested during pod build-up to verify successful performance of key FLIR subsystems for both pods. Other successful technology developments were slip rings for continuous roll, compact power supply to meet volume constraints, and missile boresight correlator for automatic alignment of Maverick missile to LANTIRN FLIR.

(2) (U) FY 1983 Program: Delivery of pods fabricated as full-scale development systems is scheduled during mid to late FY 1983. The navigation pod will be integrated with the F-16 and ready for flight test beginning July 1983. The targeting pod will be ready for flight test in November 1983. Production decision on F-16 and A-10 HUDs will be finalized and funded for first lot production. Establishment of interim simulator for LANTIRN training will be initiated by procuring additional computer equipment to enhance existing Air Force facilities.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Flight testing of navigation and targeting pods on F-16 aircraft will be continued in preparation of the production decision for long lead in Feb 1985. The testing is scheduled throughout FY 1984 as an extensive evaluation of Single Seat Night Attack capability when LANTIRN is employed. Development and fabrication will continue for the associated support equipment. The cost estimate is based on existing contract with the prime contractor for development costs and detailed Air Force Independent Cost Analysis for total development and production costs.

(4) (U) Program to Completion: Production decision and long lead award in Feb 1985 will lead to first delivery of the navigation and targeting pods beginning Aug 1987. Production of support equipment is scheduled to match pod delivery schedule. Navigation and targeting pods will be produced through FY 92 for a total of 720 podsets and associated support equipment.

C. (U) MAJOR MILESTONES:

	Milestones	Dates
(1)	Begin F-16 flight test	
	Head-Up-Display	Jun 1982
	Pods	Jul 1983
(2)	Complete flight test	Dec 1984
(3)	Production Decision/long lead award	Feb 1985
(4)	First production pod delivery	Aug 1987

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64268F Title: Aircraft Engine Component Improvement Program (CIP)
DOD Mission Area: #223, Close Air Support and Interdiction Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	121,889	107,312	142,031	156,482	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF PROGRAM ELEMENT AND MISSION NEED: Aircraft engine component improvement programs (CIP) are initiated after an engine/component has successfully completed all of the required development tests, meets the specification in the development contract, and the first production funded aircraft using the engine/component is accepted by the Air Force. Historically, systems add offensive/defensive equipment, have mission and/or tactics changes, and operate in different environments to meet the ever-changing threats. It has been demonstrated that an active engine component improvement program is an effective means of reducing the cost of engine ownership, and improving system operational readiness through improvements in durability, maintainability, operability, reliability, reparability, and suitability of the engine as operational conditions change and service time is accumulated. System changes continue throughout the operational life of a system; therefore, the engine component improvement program must continue at a reasonable level to provide the engineering support required to obtain engine changes which are essential for satisfactory system performance in operational use at a cost affordable to the Air Force. The funds being requested represent the Air Force requirements only and do not include funds required from other Services or Foreign Military Sales on joint programs.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	123,889	120,472	156,429		Continuing	Not Applicable

(U) $2 Million was reprogrammed in FY 1982 to begin qualification of the Digital Electronic Engine Control for the F100 engine. Reduction of FY 1984 funds resulted from reduction of effort resolving service revealed problems to support higher priority programs.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

5. (U) RELATED ACTIVITIES: For requisite technology, this program draws on "core" engine technology (compressor, combustor, and high pressure turbine) from Program Element (PE) 63216F, Advanced Turbine Engine Gas Generator. Fan and low pressure turbine technology are provided by PE 63202F, Aircraft Propulsion Subsystem Integration. Materials processing and component fabrication demonstration come from PE 78011F, Manufacturing Technology Program. Additional component/engine test data is contributed by PE 64218F, Engine Model Derivative Program. The Navy and Army have supporting engine component improvement programs.

Program Element: #64268F Title: Aircraft Engine Component Improvement Program (CIP)
DOD Mission Area: #223, Close Air Support and Interdiction Budget Activity: #4, Tactical Programs

6. (U) WORK PERFORMED BY: The overall program is managed by the Aeronautical Systems Divsion, Deputy for Propulsion, Wright-Patteron AFB, OH. Individual engine component improvement programs are managed by the Aeronautical Systems Division, Deputy for Propulsion and the Air Force Logistics Command's San Antonio Air Logistics Center and Oklahoma City Air Logistics Center. In-house test and evaluation efforts are conducted at the Arnold Engineering Development Center, Tullahoma, TN and the Air Force Flight Test Center, Edwards AFB, CA. Contractors include Detroit Diesel Allison Division, Indianapolis, IN (T56, TF41 engines); General Electric Company, Evendale, OH (J79, TF39, F101 engines); General Electric Company, Lynn, MA (J85, J85-21, TF34, T64, T58 engines); Air Research (Garrett) Phoenix, AZ (T76 and GPU); Pratt and Whitney Aircraft of Canada, Ltd (T400); Pratt and Whitney Aircraft, West Palm Beach, FL (J57, J75, F100, TF30, TF33 engines); Solar Division of International Harvester, (GTU); and Teledyne CAE, Toledo, OH (J69 engine).

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 84: Not Applicable.

8. (U) PROJECT OVER $10 MILLION IN FY 84:

(U) Aircraft Engine Component Improvement Program (CIP)

A. (U) Project Description: A CIP is required for each operational engine in order to be able to identify and resolve operational problems and potential cost avoidance that arise during service use. The CIP for each engine generally consists of the following types of efforts: (1) analytical and test efforts to identify the life limiting parts of an engine so that corrective actions can be initiated before operational use is impacted; (2) evaluation of new hardware for reducing adverse engine impact on the environment; (3) demonstrations to provide review/revision of maintainability actions to establish and update inspection limits and techniques for field and overhaul activities; (4) investigation of field and test failures to determine the significance and, where appropriate, generate changes on a timely basis to reduce the impact on the aircraft mission; (5) reduction of maintenance and spare parts costs through the development, evaluation, qualification, and introduction of repair techniques or redesigned parts; and (6) flight and ground tests on engines/components to provide immediate investigation of service revealed discrepancies and to evaluate proposed engineering changes. Age, use, quantity of engines and operational experience are factors considered in determining the resource allocation to each of these efforts within a given engine CIP.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) (U) FY 1982 Accomplishments: This engine component improvement program was funded in the procurement appropriation in FY 1979 and prior and the R&D appropriations for FY 1980 and beyond many of these accomplishments represent the culmination of long term efforts. Specific accomplishments include:

(U) F100 Engine:
(1) (U) Developed engineering changes which resulted in substantial cost avoidance.
(2) (U) Resolved major operational problems such as stall-stagnation.
(3) (U) Reduced inflight shutdowns from over 6 to less than 2 per 1000 engine flight hours.
(4) (U) Increased the maximum operating time for the various modules by a factor of 2 to 3.
(5) (U) Reduced unscheduled engine removal rate from 6.6/1000 EFH in 1979 to 5.4 in 1982.
(6) (U) Reduced maintenance manhours per EFH from 3.4 in 1979 to 2.4 in 1982.
(7) (U) Developed repairs that resulted in 15.1 return on investment.

C-14

Program Element: #64268F Title: Aircraft Engine Component Improvement Program (CIP)
DOD Mission Area: #223, Close Air Support and Interdiction Budget Activity: #4, Tactical Programs

(U) TF34 Engine:
(1) (U) Corrected the number 3 bearing problem.
(2) (U) Demonstrated fixes which have reduced the depot cost per flying hour from $1,176 to $305; and which have reduced the total cost per flight hour from $5,762 to $588.
(3) (U) One year's CIP effort resulted in production cost reduction of $4,300 per engine and $68 million in logistics cost avoidance.
(4) (U) Reduced maintenance manhours/EFH to less than one.
(5) (U) Completed structural life assessment for complete engine.

(U) TF30 Engine:
(1) (U) Demonstrated engineering improvements which resulted in substantial logistics cost avoidance.
(2) (U) Demonstrated a redesigned first stage turbine disc with a low cycle fatigue life of 6000 hours versus an original disc life of 1600 hours.
(3) (U) Improved low cycle fatigue life of fan and compressor rotor systems.

(U) TF41 Engine:
(1) (U) Redesigned the turbine blades to correct a safety of flight condition.
(2) (U) Identified the critical life limits on forty-one (41) cycle sensitive parts and conducted a risk assessment using service experience, test data, and finite element analysis techniques.
(3) (U) Redesign high pressure turbine blade that provided $169.5 million logistics cost avoidance.

(U) OTHER ENGINES: The maximum operating time has been increased dramatically for all engines in the Component Improvement Program (CIP). In a recent five year span, engineering changes on the J57 resulted in over $131.1 million in cost avoidance, and the TF33 has had over $249.6 million in cost avoidance changes.

(2) (U) FY 1983 Program: Although this program provides continuing engineering support for all engines and related hardware in the Air Force inventory, the major effort will be directed to the following programs:

(U) F100 Engine: This program contains 108 specific tasks which are intended to (1) reduce air aborts and Class A and Class B accidents; (2) reduce premature engine removals per 1000 engine flight hours by ten percent; (3) continue to reduce maintenance manhours per engine flight hour by ten percent; (4) continue to reduce the cost of operating and supporting the engine per engine flight hour. Major effort will be directed toward improving hot section durability through verification work on the increased life core. Efforts will be conducted to improve the life of the second stage compressor airseal and the Compressor Inlet Variable Vane (CIVV) synchronizing ring. Elimination of 12th and 13th stage vanes and case cracking will be worked. The electronic engine control will be modified to increase the augmentor Segment V lockout region to reduce augmenter blowout and engine stall. Work will be accomplished on an improved reliability ignition system and a longer life main igniter. Work on an improved life main fuel pump will be conducted. Efforts will be conducted to improve control system reliability through simplified Back-up Control (BUC) coupling, improved electrical components, and a revised cam to improve Upper Left Hand Corner (ULHC) augmentor operation. Testing will include accelerated mission testing, altitude functional suitability testing, altitude functional suitability testing, feasibility testing, and rig and core engine testing. Repair procedures will be developed and tested to

Program Element: #64268F Title: Aircraft Engine Component Improvement Program (CIP)
DOD Mission Area: #223, Close Air Support and Interdiction Budget Activity: #4, Tactical Programs

reduce spare part buy requirements and extend the useful life of engines.

(U) TF34: This program is structured to provide a cost effective engineering program to design, qualify and introduce hardware changes to address the following goals: (1) reduce the percent of engines not mission capable down to ten percent; (2) reduce unscheduled engine removals per 1000 engine flight hours by 15 percent; (3) reduce maintenance manhours per engine flight hour by 20 percent. Effort will also be directed toward eliminating all failure modes which impact safety of flight and toward improving operational readiness. The program continues a life management program which provides a means for predicting and tracking hardware low cycle fatigue and thermal cyclic life limits; development and evaluation of component repair procedures to reduce the frequency of repair and replacement of major components. Extensive factory accelerated mission testing (AMT) and component testing will be accomplished.

(U) TF30: The contractual engineering effort for this engine will cover the continued redesign/modification necessary to resolve flight safety failures to evaluate the correct service revealed deficiencies, and to provide engineering designs for developing and testing repairs for depot and field implementation. Efforts will include work on improved life for compressor rotor parts, develop containment capability for fan section, improve life high pressure turbine rotor and a more durable fourth stage turbine blade. Testing will reduce air aborts per 1000 engine flight hours by 20 percent, (2) reduce unscheduled engine removals by five percent, and (3) reduce maintenance manhours per engine flight hour by eight percent.

(U) TF41: Efforts will be conducted to resolve flight safety problems, address service revealed deficiencies and assist logistics support by developing repair procedures. Effort will be expended for a life limit extension. Improved reliability fuel system components and accessories will be worked. Extensive accelerated mission testing will be accomplished. These and other planned tasks should permit: (1) reducing air aborts per 1000 engine flight hours by 20 percent, (2) reduce unscheduled engine removals by 20 percent, and (3) reduce maintenance manhours per engine flight hour by ten percent.

(U) TF39: Engineering effort will be directed towards resolving service revealed problems and conducting fleet leader engine testing to provide early problem identification and correction as well as verifying fixes for service revealed deficiencies. Major effort will be directed toward the development of repair procedures to extend the useful life of expensive parts such as compressor case cracking and fan interlock wear. Tasks include improved cyclic life for the compressor rear shaft and improved reliability for the anti-ice valve. Work will be accomplished to correct sump lube supply line failures due the chafing. Testing will include a 1000 cycle endurance test and some service evaluation flight testing.

(U) T56: The program will continue to address: (1) safety of flight problems, (2) improvements to maintain operational utility, (3) reduce field maintenance manhours and costs, (4) reduce overhaul and spare parts costs, (5) reduce premature engine removals, and (6) develop repair procedures to extend useful life of high value parts. Efforts planned include continued work to improve fatigue life limited turbine blades, evaluate an erosion resistent coating to improve compressor performance deterioration characteristics and develop increased load capacity front pinion bearing. Testing includes accelerated endurance, simulated flight endurance, and component rig evaluation tests.

Program Element: #64268F Title: Aircraft Engine Component Improvement Program (CIP)
DOD Mission Area: #223, Close Air Support and Interdiction Budget Activity: #4, Tactical Programs

(U) Other Engines: The programs for the other engines are directed toward the resolution of service revealed problems with primary emphasis on correction of all safety of flight problems. Development of repair procedures or work arounds to prevent overhaul line stoppage and maintain logistic support for the engines will be accomplished. Testing will be accomplished to verify fixes and repair procedures.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The Engine Component Improvement Program (CIP) is a continuous program carried on throughout the service life of the engines. Engineering effort will include the following general areas in conducting a CIP for engine and related hardware.

(a) (U) Investigation, definition and correction of service revealed deficiencies.
(b) (U) Improve engine reliability and maintainability by improving on the design of marginal components.
(c) (U) Extend the maximum operating time of the engines.
(d) (U) Reduce overhaul cost by qualifying new wear limits and determining part life.
(e) (U) Maintain engine specification requirements.
(f) (U) Provide a review of maintainability actions, establish and update inspection limits and technique for field and overhaul activities.
(g) (U) Provide early disclosure of any weakness that would limit engine life and would normally appear only after extended service operation.
(h) (U) Reduce maintenance and spare parts cost through the review, evaluation and introduction of repair techniques.
(i) (U) Initiate action to redesign and improve the marginal parts/components as soon as investigation and identification of potential weaknesses indicates such action is appropriate.
(j) (U) Reduce/eliminate causes of engine performance deterioration.

(U) The general activity above applies to all engines in the Air Force inventory to one degree or another.

The major efforts will be as follows:

(U) F100: Investigate and develop repair procedures to extend the useful life of high value parts; conduct extensive testing to verify repairs/redesigns and to discover potential problems ahead of fleet experience; reduce engine removal rate from 8.09 to 6.0 per 1000 engine flight hours; reduce maintenance manhours per engine flight hour from 2.4 to 2.0; develop improved anti-icing capability for the fan; extend maximum operating time for the backup control; develop increased durability and reduced maintenance for the augmentor/nozzle and develop improved durability core engine components and respond to causes of unscheduled engine removals.

(U) TF34: Effort on this engine will be directed toward identifying and resolving engine problems/weaknesses before they occur in the field. This will be accomplished through extensive testing and analysis. Tasks include continuation of life management and damage tolerance assessment programs; resolution of the problem of water collecting deficiencies will also be accomplished.

Program Element: #64268F Title: Aircraft Engine Component Improvement Program (CIP)
DOD Mission Area: #223, Close Air Support and Interdiction Budget Activity: #4, Tactical Programs

(U) F101 Engine: Verify engine cold part life to 6000 hours of simulated use. Confirm durability of a rate produced engine. Conduct extensive accelerated mission testing. Conduct low pressure turbine life extension life extension program.

(U) TF30: Testing will be conducted to verify fixes resulting from the fatigue life improvement program to continue extending the time on lead-the-fleet test engines. This engine has four models that have widely different mission usages which require additional testing to evaluate improvement against these mission differences. Several impending safety of flight problems will be addressed. Tasks include continuation of fan containment capability development and life extension for fan discs. Repair procedures will be developed to salvage high value components by extending their useful life.

(U) TF41: Accelerated mission tests (AMT) will be conducted to verify/qualify repair procedures and redesigns for durability and reliability improvements. Tasks include developing improved reliability main fuel pump and main fuel control. Life limit testing will be accomplished. Continue the improvement program for the turbine air seal. New repair techniques and extension of serviceable limits will be evaluated as part of the engine maturation program.

(U) TF39: The major emphasis for this engine is to reduce support costs by providing repair procedures and redesigning parts showing distress that result in premature removal of the engine. Testing will be accomplished to maintain a lead over operational engines and to verify/qualify repair procedures and redesigns.

(U) T56: This program will concentrate primarily on the investigation, definition and correction of service revealed deficiencies preventing engines from achieving the scheduled time between overhaul resulting in higher logistic support costs. Low cycle fatigue life analysis will be continued and development work for an improved durability high pressure turbine rotor will be accomplished. Effort will be directed toward maintaining engine specification requirements as the engine ages. Maintenance actions will be reviewed to establish/extend inspection limits and to develop repair techniques for field and overhaul activities.

(U) Other Engines: The remaining engines in CIP are relatively more mature and the effort on these programs is directed toward maintaining operational capability with reasonable logistic expense. As the engine ages and accumulates more time, new failure modes are identified and must be addressed. Repair and maintenance procedures are continually reviewed and modified to meet the changing characteristics of the engines.

A continuing program is conducted for each of the following engines/components to provide the efforts deemed necessary:

ENGINE MODELS	AIRCRAFT APPLICATION	FY 1984 ($ IN MILLIONS)
TF41	A-7	6.26
TF34	A-10	18.47
J85-21	F-5	.84
TF33	E-3A	1.39
J79	F-4	1.62

Program Element: #64268F Title: Aircraft Engine Component Improvement Program (CIP)
DOD Mission Area: #223, Close Air Support and Interdiction Budget Activity: #4, Tactical Programs

ENGINE MODELS	AIRCRAFT APPLICATION	FY 1984 ($ IN MILLIONS)
F100	F-15/F-16	51.58
F101	B-1B	34.18
J57	KC-135	1.38
J75	F-105	.38
J69	T-37	.86
T56	C-130	2.67
J85	T-38	.84
TF30	F-111	12.75
TF33	C-141	1.37
TF39	C-5	4.57
T58	HH-3	.26
T64	HH-53	.27
T400	UH-IN	.13
GTU/T76	ALL/OV-10	1.83
T700	UH-60	.38
	TOTAL	142.03

(U) The level of funding for each engine program was derived from a bottoms-up estimate of development costs required to meet the specific engines program objectives and was reviewed by the Engine Advisory Group comprised of technical/management specialists from the Air Force Logistics Command, Air Force Wright Aeronautical Laboratories and Air Force Systems Command.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64313F (Previously 63228F)
DOD Mission Area: Air Warfare Support, #225

Title: T-46A (Next Generation Trainer)
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING)($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
2591	TOTAL FOR PROGRAM ELEMENT	14,645	51,565	123,494	73,239	69,576	334,419

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: A need exists to maintain the Air Force's capability to provide primary flight training in its Undergraduate Pilot Training program. The T-46A program is a development and acquisition effort to replace the operationally deficient T-37 aircraft to ensure that the primary flight training capability exists beyond 1986. Forecast increases in USAF pilot training and the fact that the aging T-37 will begin to reach fleet insufficiency around 1986, dictate an Initial Operational Capability for the T-46A in 1987. The essential design characteristics include twin engines, side-by-side seating, and pressurization with significant improvements in performance (range, climb capability, sustained "g"), maintainability, and noise pollution.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	14,645	52,365	97,860		TBD	TBD
Procurement	0	N/A	N/A			

RDT&E CHANGES

- FY 84 change resulted from program re-pricing based on better data obtained during source selection

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Aircraft Procurement	0	0	5,800	188,900	2,921,100	3,115,800
Quantities	0	0	0	21	629	

Program Element: # 64313F (Previously 63228F)
DOD Mission Area: Air Warfare Support, #225

Title: T-46A (Next Generation Trainer)
Budget Activity: #4, Tactical Programs

5. (U) RELATED ACTIVITIES: The US Navy plans to replace the T-2C and TA-4J aircraft with a new jet training system, the VTXTS. The Navy has selected the British Hawk for the VTX and will use it for the advanced, or seco.. , undergraduate pilot training phase. The T-46A, however, will be used in the initial, or primary, Air Force training phase. The Hawk is too complex and has too much performance to be used as a primary trainer. A Memorandum of Understanding (MOU) concerning trainer development has been signed by both Services. This MOU ensures the two aircraft under development will be capable of being used by both Services should the need arise in the next few years. Cross participation in both acquisition programs has occurred in FY 81 and FY 82. A line item in the VTX Full Scale Development Request for Proposal will address AF requirements.

6. (U) WORK PERFORMED BY: The Air Force management of the T-46A is accomplished by the T-46A System Program Office at the Air Force Systems Command Aeronautical Systems Division, Wright Patterson Air Force Base, Ohio. Fairchild Republic Corporation and Garrett Turbine Engine Company were awarded Full Scale Development contracts for the air vehicle and engine development in July 1982. Fairchild is located in Farmingdale, NY, and Garrett is located in Phoenix, AZ. Air Force Test and Evaluation Center at Kirtland AFB, NM will manage the initial operational test and evaluation of the T-46A.

7. (U) Projects Less than $10 Million FY 1984: None

8. (U) Projects Over $10 Million in FY 1984:

(U) Project: T-46A (Single Project in Program Element)

A. (U) Project Description: N/A

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The Request for Proposal for Full Scale Development (FSD) was released in Oct 1981 and responses were received in Dec 1981. Source Selection was conducted from Dec 1981 until June 1982. The FSD contract for the air vehicle and engine were awarded respectively to Fairchild Republic Corporation and Garrett Turbine Engine Company in July 1982. Full Scale Development began in July 1982.

(2) (U) FY 1983 Program: Most major FSD activities will be underway in FY 1983. Incremental Preliminary Design Reviews will occur from 6 Dec 1982 through 3 Feb 1983. Incremental Critical Design Reviews will occur in July and August 1983. The first of three Production Readiness Reviews will occur in May 1983. During 1983, Fairchild will release its engineering drawings. Simultaneously, Fairchild will identify long lead requirements and begin to order raw material. Tooling for production is a major effort in FY 1983, and manufacturing will begin for some subassemblies. Major test activities include testing for structural components, mockup development for crew station escape tests, and wind tunnel tests. Integrated Logistics Support Planning will center around various plans development. The engine contractor will proceed with engine component development through FY 1983.

Program Element: # 64313F (Previously 63228F)
DOD Mission Area: Air Warfare Support, #225

Title: T-46A (Next Generation Trainer)
Budget Activity: #4, Tactical Programs

(3) (U) FY 1984 Planned Program and Basis for FY 1984, RDT&E Request: The FY 1984 program will continue the Full Scale Development effort begun in FY 1982-1983. Specifically, Fairchild will complete engineering drawings, tool planning, tool design, and tool manufacture. Manufacturing efforts will include major assembly of the static and durability test articles, and major assembly of the two FSD aircraft. Ground testing for all major subsystems will reach peak effort in FY 1984. Engine component development tests will near completion, and engine development tests will be underway. Logistics efforts include support equipment planning and spares long lead release. The first T-46A parametric cost estimate in FY 1981 was developed through the use of the Rand Dapea III model. The T-46A Source Selection (December 1981 - June 1982) resulted in program scope refinements and the development of a Most Probable Cost and Independent Cost Analysis (ICA). The ICA briefing is currently proceeding through channels to the OSD Cost Analysis Improvement Group (CAIG).

(4) (U) Program to Completion: In FY 1985 and beyond, FSD activities will include completion of assembly for the two test aircraft and first flight. Developmental Test and Evaluation and Operational Test and Evaluation will be conducted at Edwards AFB, and at operational sites. The static and durability article testing, training and completion of FSD will occur in FY 1987.

C. (U) Major Milestones:

			DATE
1.	Mission Element Statement		June 1979
2.	FSD Contract Award	*(Spring 1982)	July 1982
3.	Full Scale Development Initiation	*(Spring 1982)	July 1982
4.	Preliminary Design Review		Feb 1983
5.	Critical Design Review		Aug 1983
6.	Milestone II Review		Oct 1983
7.	Release of long lead items		Jan 1984
8.	Initial Flight Test	*(February 1985)	Mar 1985
9.	First Production Item		Dec 1985
10.	Milestone III	*(April 1986)	Aug 1986
11.	Inital Operational Capability	*(Oct 1987)	Sep 1987

Explanation of Milestone Changes: *Last year's generic milestone estimates have been refined as a result of completing source selection and signing a Full Scale Development Contract. Only minor adjustments have occurred.

Budget Activity: Tactical Programs, #4
Program Element: #64313F, T-46A

Test and Evaluation Data

1. (U) Development Test and Evaluation:

(U) The T-46A Development Test and Evaluation (DT&E) program is structured into two major divisions: contractor conducted ground tests and Combined Test Force conducted flight tests. The contractor ground tests are planned, schedule, directed and conducted by the contractor. These tests include Engineering Development Verification/Pre-Qualification, Qualification/Preflight Integration, and Acceptance. The Combined Test Force will incorporate contractor and Government test requirements into a single integrated plan, using contractor and Air Force flight crews. This program includes Flying Qualities Tests, Structural Tests, Performance, Propulsion and Fuel System Tests, Reliability, Maintainability, and Logistics Supportability Tests, and Technical Order Verification.

(U) The primary objectives of Development Test and Evaluation are: verify the design of the T-46A air vehicle and components; verify the performance of the T-46A air vehicle and components; evaluate T-46A support equipment, maintenance and operating procedures; acquire data to assess and support changes to other components of the Undergraduate Pilot Training System; identify T-46A system deficiencies and evaluate changes resulting from tests; acquire data to support the T-46A system production process.

(U) Two T-46A test aircraft will be flight tested at Edwards AFB. Except for the Government furnished Airborne Test Instrumentation System, Development Test and Evaluation, Operational Test and Evaluation, and production aircraft are similarily configured.

(U) The T-46A Test Planning Working Group, chaired by the T-46A Program Office test manager, will plan and coordinate Development Test and Evaluation and integrate operational test and evaluation into the program. Members of the Test Planning Working Group are the T-46A Program Office, the F-109 Engine Program Office, Air Force Flight Test Center, Air Force Test and Evaluation Center, Air Training Command, Air Force Logistics Command, Arnold Engineering Development Center, the 6585 Test Group, and the contractor. The Air Force Systems Command Program Manager is Lt Col Vic Barnett. The airframe and engine contractors are Fairchild Republic Corp and Garrett Turbine Engine Company, respectively.

(U) Data on Reliability, Maintainability, Availability, and Logistics Supportability will be acquired on operationally representative equipment during flight tests using the Air Force Flight Test Center System Effectiveness Data System. During the first half of the Development Test and Evaluation /Initial Operational Test and Evaluation effort, Air Force personnel will perform "over-the-shoulder" and "hands-on" maintenance under the contractors' supervision. In order to make an initial assessment of the T-46A maintenance concept, Air Force personnel will perform all maintenance during the latter part of Development Test and Evaluation/Initial Operational Test and Evaluation.

Budget Activity: Tactical Programs, #4
Program Element: #64313F, T-46A

2. (U) Operational Test and Evaluation:

(U) AFTEC has been directed to manage the initial operational test and evaluation (IOT&E) portion of the combined developmental test and evaluation (DT&E)/IOT&E and dedicated IOT&E of the T-46.

(U) The T-46 IOT&E will be conducted to evaluate the T-46's operational effectiveness and suitability, to identify operational deficiencies, and to identify the need for any modifications. The suitability evaluation will be conducted during the entire DT&E/IOT&E test program and will focus on the T-46's reliability, maintainability, and availability values. The effectiveness evaluation will consist of 90 dedicated IOT&E sorties and focus on the operational effectiveness of the T-46 as a primary trainer. During the dedicated IOT&E sorties, 9 ATC T-37 line instructor pilots (IPs) will receive 10 sorties each and fly missions outlined in the T-37 or T-46 training syllabus. Combined DT&E/IOT&E is scheduled for March 1985 to July 1986. Dedicated IOT&E is scheduled for April 1986 to July 1986, with AFSARC II scheduled for August of 1986.

3. (U) Systems Characteristics:

Characteristics	Objectives	Demonstrated
Fuel/Time	Fuel for 1.5 hour formation flight at 15,000 feet, approach, 300 Nautical mile alternate diversion	To be determined
Runway length	5,000 feet runway capability (5,000 feet pressure altitude, 100°F)	To be determined
Cruise speed	Minimum cruise 300 knots at 25,000 feet	To be determined
Landing approach speed	Landing approach 90-110 knots	To be determined
Single engine climb gradient	3.5% (takeoff, 5,000 feet pressure altitude, 100°F)	To be determined
Climb capacity	2,000 feet per minute rate of climb at 25,000 feet	To be determined
Cruise altitude	Sustained cruise up to 35,000	To be determined

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64314F
DOD Mission Area: #221, Counter Air

Title: Advanced Medium Range Air-to-Air Missile (AMRAAM)
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	136,483	206,480	188,621	201,221	87,278	820,083

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This joint Air Force/Navy program is structured in response to the Joint Service Operational Requirement and Mission Element Need Statement to significantly improve operational utility and combat effectiveness through development of an AIM-7/SPARROW follow-on, air superiority, air-to-air missile. A North Atlantic Treaty Organization (NATO) Staff Target titled "Operational Objective for NATO Air-to-Air Missiles for the 1980s and Beyond" has identified a similar requirement. The need described is for an adverse weather, all aspect, all environment air-to-air missile compatible with the F-14, F-15, F-16, F-18 and appropriate NATO air superiority and air defense aircraft. The missile must have a performance envelope significantly improved over the AIM-7F/M, increased missile velocity, a launch and maneuver employment capability, and the capacity for multiple target attack during a single intercept. AMRAAM, designated the AIM-120A, will satisfy these needs. AMRAAM Full Scale Development (FSD) is funded under this program element.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
RDT&E	138,079	207,601	192,670		260,446	798,796

EXPLANATION OF DIFFERENCES: FY 1982: Funds reprogrammed to higher priority programs. FY 1983: Allocation of RDT&E general reduction. FY 1984: Inflation rate adjustment. FY 1985 and 1986 (final year of RDT&E): Allocation of RDT&E general reduction, inflation rate adjustments, and programatic adjustment.

4. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Missile Procurement (PE 27163F)						
Funds			62,639	445,895	TBD	TBD
Quantities				224		
Missile Procurement (PE 78011F)						
Funds (Industrial Preparedness)	5,154	7,268	10,700	2,000		25,122

Program Element: #64314F
DOD Mission Area: #221, Counter Air

Title: Advanced Medium Range Air-to-Air Missile (AMRAAM)
Budget Activity: #4, Tactical Programs

5. (U) RELATED ACTIVITIES: The Advanced Medium Range Air-to-Air Missile development program is a Joint Service effort with the Air Force as Executive Service and Navy personnel integrated into the Joint System Program Office (JSPO). The Navy has assigned to the JSPO, the Deputy Program Manager, the Assistant Chief Engineer and various other assistants for logistics, budget, project management, and test. The Joint System Program Office is maintaining a close relationship with the F-14, F-15, F-16 and F-18 program offices to assure that proper consideration is given to the aircraft modifications that will be required. Other programs related to the full employment capability of AMRAAM include target identification and improved aircraft radar target processing techniques.

(U) The AMRAAM Validation Phase was funded under Program Elements 63370F and 63370N. Funding for Navy peculiar Full Scale Development requirements and Operational Evaluation is included in Program Element 64314N. Air Force procurement of AMRAAM will be funded under Program Element 27163F beginning in fiscal year 1984.

6. (U) WORK PERFORMED BY: The Advanced Medium Range Air-to-Air Missile development and acquisition program is being managed by the AMRAAM Joint System Program Office at the Armament Division, Eglin Air Force Base, FL. In addition to the Armament Division, other government organizations/facilities participating in the development effort include White Sands Missile Range, NM; Air Force Avionics Laboratory, Wright-Patterson Air Force Base, OH; Air Force Materials Laboratory, Wright-Patterson Air Force Base, OH; Pacific Missile Test Center, Naval Air Station, Pt Mugu, CA; and Naval Weapons Center, China Lake, CA. Hughes Aircraft Company, Canoga Park, CA, was selected as the prime contractor for full scale development and as leader for initial production (under a leader-follower concept) of AMRAAM. Raytheon Company, Bedford, MA, was awarded a contract to be a follower contractor during FSD and a second source competitive producer of AMRAAM.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: None.

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: AMRAAM

A. (U) Project Description: The AMRAAM development effort has the objective of significantly increasing United States and NATO air-to-air capability for 1986 and beyond by producing a more effective, reliable, affordable, maintainable missile, with emphasis on low altitude targets in an electronic countermeasures environment. To satisfy the MENS, JSOR, and NATO Staff Target, the proposed AMRAAM design utilizes various guidance modes which include inertial midcourse guidance and active radar terminal guidance. Key features which will improve operational utility of the missile include: high average missile velocity, improved missile envelope over the AIM-7/SPARROW, increased maneuverability, multiple target attack, and launch and maneuver capabilities. Mature technologies, such as solid state electronics, high rate digital computers, and terminal guidance-aided fuzing are featured. Of prime importance is the requirement for the AMRAAM to be totally compatible with the fire/weapons control systems of the F-14, F-15, F-16, and F/A-18. Germany and the United Kingdom plan to employ AMRAAM on the F-4E and the Tornado F2 respectively.

(U) Two contractors were selected for a competitive Validation Phase beginning in February 1979. To validate their

Program Element: #64314F
DOD Mission Area: #221, Counter Air

Title: Advanced Medium Range Air-to-Air Missile (AMRAAM)
Budget Activity: #4, Tactical Programs

Advanced Medium Range Air-to-Air Missile concepts each contractor conducted extensive ground component simulation, captive carry, and free flight testing. Based on the results of validation testing and the contractors' proposals, Hughes Aircraft Company of Canoga Park, CA, was awarded a contract for the full scale development of their design, including development/modification of launchers. Rail launchers will be developed to provide the necessary aircraft/missile interfaces and will be capable of AMRAAM and AIM-9/SIDEWINDER carriage. Current SPARROW ejection launchers will be modified so that they have both an AMRAAM and a SPARROW capability.

B. (U) Program Accomplishments and Future Programs:

(1) (U) FY 1982 Accomplishments: The Validation Phase testing was completed. Based on the results of the prototype testing and evaluation of the contractors' proposals for FSD and initial procurement options, Hughes Aircraft Company was selected to continue the development of AMRAAM. Additional prototype vehicles were tested in early 1982; included was an evaluation of missile capability in a clustered target environment. In July 1982, a contract was awarded to Raytheon Company to be the follower under a leader/follower concept during FSD and to be the eventual second source producer of AMRAAM. Following completion of the system preliminary design review and initial production readiness review, a Defense Systems Acquisition Review Council (DSARC) Milestone II review was conducted. The decision was to continue full scale development.

(2) (U) FY 1983 Program: The contractor will continue design and development, ground testing will continue, and the captive carry flights will begin. F-15 and F-16 aircraft modifications will continue for the full scale development (FSD) program. The flight test program will begin using the AMRAAM Load Measurement Captive Vehicles for envelope definition purposes including flutter, stability, and control testing.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The development test evaluation/initial operational test and evaluation (DT&E/IOT&E) program will begin. The F-16 will be the first aircraft of four types in this guided test vehicle launch program. The Test Analyze and Fix (TAAF) program and Captive Carry Reliability Program (CCRP) will begin. The critical design review is scheduled for completion. An Air Force Systems Acquisition Review Council is planned for January 1984 to obtain approval for release of the Advance Buy funding to support initial production in FY 1985. The RDT&E program cost reflected in this request is based on a program office estimate (grass roots) verified by an Independent Cost Analysis (ICA) accomplished in FY 1982.

(4) Program to Completion: AMRAAM FSD and DT&E/IOT&E will be completed. Initial production will begin in FY 1985. First production delivery is planned for late FY 1985 with the initial operational capability fo planned for FY 1986.

C. Major Milestones:

Milestones	Dates
(1) Start Design Definition	October 1976

Program Element: #64314F
DOD Mission Area: #221, Counter Air

Title: Advanced Medium Range Air-to-Air Missile (AMRAAM)
Budget Activity: #4, Tactical Programs

(2)	Complete Design Definition		May 1977
(3)	Start Pre-prototype Evaluations		July 1978
(4)	Complete Pre-prototype Evaluations		September 1978
(5)	Milestone I		November 1978
(6)	Award Validation Phase Contracts		February 1979
(7)	Validation Phase Complete		November 1981
(8)	Award Full Scale Development Contract		December 1981
(9)	Full Scale Development Subsystem Tests Start		May 1982
(10)	Preliminary Design Review	*(September 1982)	August 1982
(11)	Milestone II		September 1982
(12)	Full Scale Development Flight Tests Start (Missile Free Flight)	*(January 1984)	March 1984
(13)	First Production Delivery		September 1985
(14)	Full Scale Development Flight Tests End		February 1986
(15)	Full Scale Development Subsystem Tests End		February 1986
(16)	Initial Operational Capability		- -

* Date presented in Fiscal Year 1983 Descriptive Summaries.

(U) EXPLANATION OF MILESTONE CHANGES:

(10) Preliminary design review held one month earlier than originally scheduled since the contractor was ready at that time and the Air Force desired the earlier review.

(12) The original program office schedule estimate for the start of full scale development flight testing was adjusted two months due to the definitization of the schedule resulting from the award of the full scale development contract.

Budget Activity: Tactical Programs, #4
Program Element: 64314F - Advanced Medium Range Air-to-Air Missile (AMRAAM)

Test and Evaluation Data:

1. (U) Development Test and Evaluation: Development of AMRAAM is being managed by the AMRAAM Joint System Program Office (JSPO) at Eglin AFB, FL under the command of the Armament Division of the Air Force Systems Command. The 3246th Test Wing at the Armament Division is the Responsible Test Organization for Development Test and Evaluation (DT&E). To conduct DT&E testing, the 3246th Test Wing has formed a Joint Test Force that includes both Air Force and Navy personnel. The Air Force Test and Evaluation Center (AFTEC) will have overall management responsibility for AMRAAM Initial Operational Test and Evaluation (IOT&E).

(U) Following the completion of concept definition and Milestone I (November 1978), contracts were awarded to Hughes and Raytheon, 2 February 1979, for the competitive Validation Phase. In early fiscal year 1982, Hughes was selected to begin Full Scale Development (FSD). Milestone II was held in September 1982 after completion of system Preliminary Design Review. Combined DT&E/IOT&E is planned for the Full Scale Development (FSD) phase.

(U) Validation phase test and evaluation was initiated early in fiscal year 1980 and included a variety of ground captive carry and free flight testing intended to provide data necessary for management to confirm that the AMRAAM concept was sound and that the technical risks in proceeding with FSD were acceptable. To faciliate the validation testing, each of the competing contractors developed their own missile design and fabricated hardware which matured in design from early checkout vehicles to prototype AMRAAMs.

(U) Each contractor's prototype hardware was tested to examine its potential for satisfying the Joint Service Operational Requirements such as improved end game performance, look-down shoot-down capabilities, multimode guidance flexibility, enhanced electronic counter-countermeasures potential, multi-aircraft compatibility and reliability and performance goals. Included in the free flight testing were demonstrations of AMRAAM's unique autonomous guidance mode, as well as a command-inertial active guidance mode. The following results were achieved with the major test assets:

a. (U) Instrumented Measurement Vehicle - These test assets were designed to measure temperature and vibration characteristics of the missile and launcher during carriage aboard the various aircraft. Hughes Aircraft Company hardware was tested from November 1979 through October 1981. The missions flown included ten on the F-14, 19 on the F-15, and 17 on the F-16. Raytheon Company hardware was tested from June 1980 through May 1981; the missions flown included eight on the F-14, 17 on the F-15, and seven on the F-16. The Instrumented Measurement Vehicle tests aided the development of the data base for the FSD Test Analyses and Fix reliability program and resulted in a physical strengthening of the missile airframe and rail launcher.

Budget Activity Tactical Programs #4
Program Element: 64314F - Advanced Medium Range Air-to-Air Missile (AMRAAM)

b. (U) Seeker Test Unit - These test assets were used for development and evaluation of the seeker and guidance subcomponents. Hughes Aircraft Company hardware was tested from December 1979 through September 1982. One hundred eighteen missions were flown to evaluate all design functions of the weapon system with the exception of complex electronic countermeasure waveforms. Waveform studies were conducted at the simulation facility, Army Missile Command, Redstone Arsenal, Alabama. Raytheon Company hardware was tested from December 1980 through November 1981. Twenty-four missions were flown to evaluate the Raytheon seeker. The seeker test unit tests will result in an improved data link code to prevent interference between aircraft and missiles, an improved initialization algorithm for operation in heavy clutter environments and various improvements in seeker acquisition and tracking algorithms.

c. (U) Separation and Controlled Test Vehicles were used to provide separation and airframe control data. Hughes Aircraft Company launced four separation test vehicles between June 1980 and October 1981. Raytheon company launched two control test vehicles between January and April 1981. A launch latch release problem was encountered and corrected (in the Raytheon design).

d. Guided Test Vehicles - These test assets were used to demonstrate improved end game performance, look down/shoot down capabilities, multimode guidance flexibility, electronic counter countermeasure potential, compatibility with the F-14, F-15, and F-16 aircraft, and to develop reliability and performance data. The 1981 test plan had a schedule of ten guided test vehicle firings by each contractor. However, additional use of the Seeker Test Unit (STU) and selection of Hughes as the design leader reduced the required number of firings to six. These were launched between June 1981 and September 1982. Although all flight tests were not completely successful, all test objectives were met. The Validation Phase Guided Test Vehicle testing will result in improvements to the system electrical, software and mechanical design. The only major subcomponent that was not tested as an integrated unit was the Hughes target detection device (fuze). Target detection devices developed by each contractor were tested at the Navy's Encounter Simulation Lab, Corona, California.

(U) During validation, data was collected to aid the design, to prove the weapons system concept, and support answers to the critical issues. The test hardware used during the Validation Phase was functionally the same as that planned for Full Scale Development (FSD); however, the transmitter design was changed from solid state to a traveling wave tube (TWT). The change reduces technical risk since the AMRAAM TWT is an adaptation of a TWT used in existing electronic war fare equipment. In addition TWTs in an AMRAAM configuration were laboratory tested by Hughes during validation. Design changes during FSD will result in lower cost, improved manufacturing, and improved reliability. The FSD plan calls for 87 missile firings to accomplish combined development and initial operational test and evaluation of AMRAAM using the F-14, F-15, F-16 and F/A-18 aircraft. Four of these missiles will have warheads. Captive carry vehicles will be used similarly to those used during the Validation Phase. In addition, 7 missiles will be produced for reliability testing.

Budget Activity: Tactical Programs, #4
Program Element: 64314F - Advanced Medium Range Air-to-Air Missile (AMRAAM)

2. (U) Operational Test and Evaluation (OT&E):

a. No AMRAAM OT&E has been accomplished to date. The OT&E will start in the second quarter of FY84 and will consist of both a combined development test and evaluation/initial operational test and evaluation (DT&E/IOT&E) and independent IOT&E of the F-16/AMRAAM system. Air Force is lead service with the Air Force Test and Evaluation Center (AFTEC) as OT&E test agency.

b. The IOT&E planning accomplished to date consists of an approved test approach and preliminary shot profile for both the separate IOT&E and the combined DT&E/IOT&E. The draft AFTEC test plan is being written. The combined DT&E/IOT&E program will consist of approximately 87 total missile firings from the F-14, F-15, F-16, and F-18 aircraft. During the combined testing, a concurrent but separate IOT&E test phase is planned. The combined and independent IOT&E will include AFTEC firing 25 pilot production missiles from the F-16 and a captive-carry reliability program on both the F-15 and F-16.

c. Schedule.

Activity	Date
DSARC I	Nov 78
Flight Tests Start (Validation)	Sep 80
Flight Tests End (Validation)	Sep 82
DSARC II	Sep 82
Combined DT&E/IOT&E Start	Mar 84
Separate IOT&E Start	Oct 84

d. OT&E reports published:

AMRAAM Operational Utility Evaluation Final Report. August 1982. Secret

497 531

Budget Activity: Tactical Programs, #4
Program Element: 64314F - Advanced Medium Range Air-to-Air Missile (AMRAAM)

3. Systems Characteristics: The missile is being defined in response to the Mission Element Need Statement, Joint Service Operational Requirement and the Operational Objective for NATO Air-to-Air Missiles for the 1980s and Beyond. The objectives data listed below are tentative and reflect Joint Service Operational Requirement, system specification, and the Secretary of Defense Decision Memorandum thresholds.

TEST AND EVALUATION DATA:

A. Performance	Objectives	Demonstrated
Speed, Maximum Mach		To be demonstrated
Altitude, Feet		
Maximum		To be demonstrated
Minimum		To be demonstrated
Range:		
Maximum Nautical Miles		To be demonstrated
Minimum, Feet		To be demonstrated
Kill Probability, Percent		To be demonstrated

B. Reliability		Demonstrated
Mean Time Between Maintenance	450-600	To be demonstrated
Free Flight	.8-.85	To be demonstrated

C. Missle Description	
Launch Weight (pounds)	327-350
Guidance Type	Active radar terminal/inertial mid-course
Compatibility	F-14, F-15, F-16, F-18, F-4F (German), Tornado (British)

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64321F
DOD Mission Area: #344, Tactical Command and Control

Title: Joint Tactical Fusion Program
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	5,238	5,280	4,873	TBD	TBD	TBD

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The tactical forces have a need to rapidly (on a Near Real Time basis) exploit time-sensitive and high volume, multi-sensor information. The objective of this program is to develop and field an Enemy Situation Correlation Element (ENSCE) by 1985 which will correlate and aggregate multi-source sensor data; provide precise location of opposing force structures or nodes; and provide ground battle situation displays to support the Tactical Air Control Centers. Information will be shared with the Army All-Source Analysis (ASAS) System.

3. (U) EXPLANATION OF PROGRAM STATUS: The Army is the Executive Agent for this Congressionally directed Joint Army-Air Force program. Fundamental organizational changes in the management of the Joint Tactical Fusion Program were implemented in November 1982. The new approach is based on approval by the Chief of Staff of the Army of a development and acquisition strategy for the AllSource Analysis System and the ENSCE. The Office of the Secretary of Defense (Research and Engineering) provided details of the revised Army and Air Force program plans to the HAC, SAC, SSCI, and HPSCI in a letter (classified SECRET) dated 17 December 1982. FY 84 funds will be used to continue Air Force participation at previous level. Once Congress approves the Acquisition Plan to be presented by the Executive Agent in March 83, revised estimates will be provided.

Program Element: #64325F Title: Standoff Attack Weapon
DOD Mission Area: 223, Close Air Support and Interdiction Budget Activity: #4 Tactical Programs

1. (U) RESOURCES ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	0	16,373	67,158	56,831	140,362

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Air Force has a need for a short range standoff weapon which can carry a variety of submunitions suitable for use against a wide range of targets. This, in conjunction with aircraft systems capable of navigating to and locating targets, could provide the Tactical Air Forces with a 24-hour in-weather capability to deny the enemy full use of his war-making potential, while preserving the friendly force structure. The Standoff Attack Weapon will provide the Tactical Air Forces with a dispenser weapon system capable of being delivered from low altitude and at ranges beyond the reach of defensive systems located in the immediate target vicinity. Targets include:

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY ($ in thousands): Not applicable. This program is a FY 1984 new start.

4. (U) OTHER APPROPRIATIONS ($ in thousands):

Other Procurement	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Funds	0	0	0	0	TBD	TBD
Quantities	0	0	0	0	TBD	TBD

5. (U) RELATED ACTIVITIES: This development is supported by related dispenser system and guidance developments under the Conventional Weapons Technology (PE 63601F) program and submunitions developed under the Armament/Ordnance Development (PE 64602F) program and the Wide Area Antiarmor Munitions (PE 64607F) program.

6. (U) WORKED PERFORMED BY: Major development agency for the Standoff Attack Weapon is the Air Force's Armament Division, Eglin AFB, Florida. Development contractors for the Standoff Attack Weapon have not been selected.

Program Element: #64325F Title: Standoff Attack Weapon
DOD Mission Area: 223, Close Air Support and Interdiction Budget Activity: #4 - Tactical Programs

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) STANDOFF ATTACK WEAPON (SINGLE PROJECT)

A. Project Description: The Standoff Attack Weapon program is a new start in FY 1984. It is being initiated to develop a guided, powered dispenser capable of delivering approximately of payload to distances of 10 to 20 nautical miles, when launched from low altitude, against a variety of targets. The Standoff Attack Weapon will provide the Air Force with a weapon system capable of being delivered off-boresight from low altitude and at ranges sufficient to avoid defenses in the immediate target vicinity. The initial version will utilize existing technology to achieve an early availability and to reduce costs. The Standoff Attack Weapon will be improved through a preplanned product improvement program.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Not Applicable

(2) (U) FY 1983 Program: Not Applicable

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: A request for proposal will be issued to interested contractors and one will be selected to initiate Full Scale Development of the Standoff Attack Weapon. FY 1984 funds will be used to initiate development and integration studies of the submunition dispenser, guidance, propulsion and air vehicle. A plan will also be developed for a phased improvement program of the initial Standoff Attack Weapon. Program costs were generated by Air Force System Command cost-estimating techniques.

(4) (U) Program to Completion: Complete Full Scale Development of the initial Standoff Attack Weapon and conduct Development Test and Evaluation/Initial Operational Test and Evaluation leading to a production decision in FY 1987. Conduct a Preplanned Product Improved program for the Standoff Attack Weapon.

C. (U) Major Milestones:

Milestones	Date
A. Contract Award	FY 1984
B. Initiate Full Scale Development	FY 1984

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64362F
DOD Mission Area: #242, Theater-Wide TNW

Title: Ground Launched Cruise Missile
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	80,065	28,581	36,532	13,200	0	378,978

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The purpose of the Ground Launched Cruise Missile (GLCM) is to counter modernization of Soviet long-range theater nuclear forces, particularly SS-20s and Backfire bombers. The need is for a highly survivable system with enough range to reach targets in the western military districts of the Soviet Union, thus helping to deter a combined Warsaw Pact and Soviet numerical superiority in both conventional and theater nuclear forces. This program element provides for full scale engineering development to adapt the TOMAHAWK cruise missile into a tactical mobile ground launched system.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

PE 64362F/RDT&E	80,065	28,581	23,950	0	0	353,300
PE 27314F/Procurement	350,500	530,700	474,000	-	1,014,200	2,561,900

(U) The additional FY84 (+$12.6M) and FY85 (+$13.2M) RDT&E requirement is for the integrated logistics support program, Reliability and Maintainability (R&M) improvements in the Transporter Erector Launcher (TEL) and Launch Control Center (LCC), and higher development costs for weapon system components such as the weapons control system software.

(U) The additional FY84-FY87 procurement requirement (+$230.9M) reflects a repricing of weapon system hardware based on actuals from the early production program. This additional requirement would be nearly twice as high except for positive Air Force action to scrub the program and a Memorandum of Agreement (MOA) for remaining TELs/LCCs ($130M savings). The FY84 budget request also includes $15M to offset higher TOMAHAWK missile unit costs caused by the reduction in the Sea Launched Cruise Missile program and $20M to pay for TOMAHAWK tooling and test equipment up front which reduces outyear funding requirements.

Program Element: #64362F
DOD Mission Area: #242, Theater-Wide TNW

Title: Ground Launched Cruise Missile
Budget Activity: #4, Tactical Programs

4. OTHER APPROPRIATION FUNDS: ($ in Thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Estimated Cost
Missile Procurement (with initial spares)	350,454	458,536	616,744	543,631	630,875	2,792,740
(Missile Quantity)	(54)	(84)	(120)	(120)	(171)	(560)
Military Construction (excludes schools, family housing & NATO funded operations facilities)	74,500	75,000	147,865	90,904	31,346	423,415
Department of Energy Costs						

5. (U) RELATED ACTIVITIES: The Ground Launched Cruise Missile program adapts the Navy TOMAHAWK missile, PE64367N, into a tactical mobile ground launched system. The Air Launched Cruise Missile (ALCM), PE64361F, is a related cruise missile program.

6. (U) WORK PERFORMED BY: The Joint Cruise Missiles Project Office located in Washington, D.C. has overall responsibility for the Ground Launched Cruise Missile development and testing. The January 1977 Cruise Missile Defense System Acquisition Review Council II direction established the Joint Cruise Missiles Project Office with the Navy as lead Service to manage current cruise missile development with special emphasis placed on commonality between programs. The Air Force Ground Launched Cruise Missiles Project Office is staffed by the Air Force within the overall auspices of the Navy Director, Joint Cruise Missiles Project Office who is the Program Manager. Air Force Systems Command, Andrews AFB, MD and Aeronautical Systems Division, Wright-Patterson AFB, OH interface and support this development activity. The Air Force Test and Evaluation Center, Kirtland AFB, NM and the Tactical Air Command, Langley AFB, VA are responsible for operational test and evaluation. The Utah Test and Training Range is the Ground Launched Cruise Missile primary test site. General Dynamics, San Diego, CA is the contractor for the TOMAHAWK missile airframe. McDonnell Douglas, St Louis, MO is the navigation/guidance contractor. To expand the cruise missile industrial base, both General Dynamics and McDonnell Douglas are being qualified as dual sources for the all-up-round (missile airframe and guidance). Williams International, Walled Lake, MI is the contractor for the engine with Teledyne, Toledo, OH as a dual source for the engine. General Dynamics is the weapons system integration contractor. GTE Sylvania is the communications subcontractor. Vitro, Silver Spring, MD is the weapons control system software and integrating contractor with McDonnell Douglas, St Louis, MO providing the hardware.

Program Element: #64362F
DOD Mission Area: #242, Theater-Wide TNW

Title: Ground Launched Cruise Missile
Budget Activity: #4, Tactical Programs

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: N/A

8. (U) GROUND LAUNCHED CRUISE MISSILE (SINGLE PROJECT OVER $10 MILLION IN FY 1984):

A. (U) Project Description: The primary elements of the GLCM system are the missile itself, a Transporter Erector Launcher (TEL), and a Launch Control Center (LCC). The missile is a variation of the TOMAHAWK (BGM-109) cruise missile currently being developed by the Navy. The TEL consists of a launcher containing four missiles which, along with associated electronic and power production equipment, is mounted on a semi-trailer. The LCC shelter is also mounted on a semi-trailer. It houses the missile launch crew and the equipment necessary for communications, missile status monitoring and missile launch. The design of the TEL, LCC, weapons control system hardware/software, and associated electronics comprise the bulk of the program. System integration and testing make up the balance of the effort.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 82 Accomplishments: Completed two Contractor Test and Evaluation flights and two Air Force Test and Evaluation flights. All were successful except for the 27 Aug 82 flight which was curtailed by a guidance problem caused by a loose connection. Continued definition of integrated logistics support, support equipment, and reliability goals. Continued development of weapons control system software with substantial positive results. Completed Survivability, Security and Safety (S^3) project at Camp Robinson, North Little Rock, Arkansas to validate critical concepts and procedures that pertain to GLCM dispersed operations. Planned and initiated nuclear certification effort which has a tight but achievable schedule for completion by Dec 83 IOC.

(2) (U) FY 1983 Program: With the flight tests on 12 Nov 82 (success) and 17 Dec 82 (engine failed to start caused by leak in pneumatic pressure system which prevented deployment of engine air inlet), only three more Developmental Test and Evaluation flights remain, and these will be completed in FY83. Mobility testing of the Transporter Erector Launcher and Launch Control Center will be completed at Aberdeen Proving Ground, Maryland. A 30 day dispersal evaluation at Ft Lewis, Washington is scheduled for Jan 83 to test prelaunch survivability, effectiveness and suitability of a typical GLCM flight deployed in terrain, foliage and climate representative of European conditions. Climatic testing in the McKinley Climatic Laboratory, Eglin AFB, Florida will be completed. Development Test and Evaluation (DT&E) and Initial Operational Test and Evaluation (IOT&E) will transition to Follow-on Operational Test and Evaluation directed by the Air Force Test and Evaluation Center which will include three operational test launches. Will provide needed documentation to allow for nuclear certification. Will continue efforts to correct deficiencies noted in hardware and software during nuclear certification process and ongoing flight/ground testing.

(3) (U) FY84 Planned Program and Basis for FY84 RDT&E Request: Will develop the integrated logistics support program and design changes to incorporate the Regency communication system into the Launch Control Center. Will complete nuclear certification required for December 1983 IOC. Will continue development of full weapons control system software capability and nuclear certification of this software. Will design Reliability and Maintainability (R&M) improvements for the weapon system components and correct deficiencies identified by the user during operational use. Will develop

Program Element: #64362F | Title: Ground Launched Cruise Missile
DOD Mission Area: #242, Theater-Wide TNW | Budget Activity: #4, Tactical Programs

depot level technical data for the European Repair Facility. The latest Air Force cost assessment of this concurrent development/production program completed in April 1982 was based on a parametric evaluation of early contractor production cost results and assumed sole source procurement.

(4) (U) Program to Completion: Will finish Reliability and Maintainability improvements, full software design with nuclear certification, Regency integration and integrated logistics support program development.

C. (U) Major Milestones:

Milestones		Date
1. DSARC II		Jan 1977
2. Program Initiation		Oct 1977
3. First Full Scale Engineering Development Flight		May 1980
4. Critical Design Review		Mar 1981
5. First Test Article Delivered		Sep 1981
6. Complete Development/Initial Operational Test & Evaluation	*(Feb 1983)	Jun 1983
7. AFSARC III		May 1983
8. Initial Operational Capability (IOC)		Dec 1983

* Date presented in Fiscal Year 1983 Descriptive Summaries

(U) EXPLANATION OF MILESTONE CHANGES

The milestone change allows completion of climatics testing and development flight testing.

Budget Activity: Ground Launched Cruise Missile
Program Element: PE64362F/27314F

1. (U) Test and Evaluation Data

a. (U) Development Test and Evaluation: The Ground Launched Cruise Missile (GLCM) test program is being managed by the Joint Cruise Missiles Project Office (JCMPO). General Dynamics is the prime integrating contractor and the Air Force Flight Test Center is the development test agency. GLCM development testing of the TOMAHAWK missile will incorporate test results from the Sea Launched and Air Launched Cruise Missile programs to reduce GLCM test requirements. Applicable areas include engine performance qualification, airframe, navigator/guidance, and missile performance.

b. (U) First contractor test launch of a TOMAHAWK missile from an engineering test unit of the Transporter Erector Launcher (TEL) occurred 16 May 1980 at Dugway Proving Ground, Utah.

c. (U) Full system testing began February 1982 using preproduction prototype missiles, TELs and Launch Control Centers (LCCs). The Air Force testing is a combined Development Test and Evaluation/Initial Operational Test and Evaluation (DT&E/IOT&E). As of 31 January 1983, three contractor and four Air Force flight tests have been conducted. All flights have been successful except for a guidance problem due to a loose connection which curtailed the 27 August 1982 mission and a pneumatic pressure system problem which prevented air inlet deployment and start of the cruise engine on the 17 December 1982 mission. Mission objectives not accomplished on the 17 December 1982 flight will be rescheduled on remaining flights.

d. (U) The DT&E program has objectives to provide data in the areas of flight test, environmental test, and operations and maintenance demonstrations.

e. (U) Flight test objectives are to provide W84 warhead flight test data to the Department of Energy, investigate launch environment effects on the TEL, and provide data to evaluate system performance for compliance with the system specification.

f. (U) Environmental test objectives address the adequacy of the GLCM system to function through its specified range of environments.

g. (U) The operations and maintenance demonstrations will focus on maintenance of the GLCM ground systems since the GLCM maintenance concept provides for only limited maintenance on the missile.

Budget Activity: Ground Launched Cruise Missile
Program Element: PE64362F/27314F

h. (U) The primary test site is the Utah Test and Training Range with tests also conducted at Aberdeen Proving Ground, MD, and Eglin Air Force Base, FL. Tests will be conducted using a total of three (3) Launch Control Centers (LCCs), four (4) Transporter Erector Launchers (TELs), and nine (9) missiles. Recovery and refurbishment of flight tested missiles will enable multiple test launches of individual missiles.

i. (U) An Extended Storage Program (ESP) during Development Test and Evaluation (DT&E)/Initial Operational Test and Evaluation (IOT&E) will use three missiles to help assess GLCM system reliability.

j. (U) Chemical/biological testing at Dugway Proving Ground, Utah and electromagnetic pulse testing at Kirtland AFB, New Mexico are planned during Follow-on Operational Test and Evaluation (FOT&E).

2. (U) Operational Test and Evaluation (OT&E)

a. (U) Operational Test and Evaluation on the GLCM weapon system officially started on 19 May 1982 with the successful launch of the first DT&E/IOT&E flight test. The second DT&E/IOT&E flight test was launched on 27 August 1982. The flight was terminated after approximately one hour with a navigation error of about six miles. All major launch related objectives were met. The third DT&E/IOT&E flight on 12 November 1982 was a successful mission. The fourth DT&E/IOT&E flight failed shortly after launch when the cruise engine did not start. The pneumatic pressure system failed to deploy the engine air inlet. The software planned for Initial Operational Capability (IOC) was used for the first time on the 17 December 1982 mission and performed successfully. The remaining three DT&E/IOT&E flight tests are planned between February and June 1983.

b. (U) The combined DT&E/IOT&E is scheduled for May 1982 through June 1983. Those aspects of the Sea Launched Cruise Missile (SLCM) and Air Launched Cruise Missile (ALCM) mission reliability, performance and survivability testing which reflect GLCM operational requirements will be used in conjunction with formal GLCM OT&E test data.

c. (U) The purpose of IOT&E will be to provide a valid estimate of the operational effectiveness suitability of the GLCM Weapon System for Air Force System Acquisition Review Council (AFSARC) III, scheduled for May 1983. The Air Force Test and Evaluation Center (AFTEC) will manage IOT&E. The Tactical Air Command (TAC), United States Air Forces Europe (USAFE), Air Training Command (ATC), Air Force Logistics Command (AFLC), Military Airlift Command (MAC), and Electronic Security Command (ESC) will participate. Personnel from US European Command (EUCOM) may participate in IOT&E of the Mission Planning Subsystem.

d. (U) The principal test location for OT&E is the Utah Test and Training Range where ten (three contractor and seven DT&E/IOT&E) preproduction prototype missiles will be launched. IOT&E will also include a four week field exercise, without missile launches, at Ft Lewis WA.

e. (U) The complete GLCM Weapon System was not available for evaluation at the start of IOT&E. Technical data and support equipment deliveries will be time-phased with a complete system available no earlier than January 1983. Depot level and centralized maintenance facility (CMF) equipment and technical data will be available in 1986. A full evaluation of logistics supportability will be completed during Follow-on Operational Test and Evaluation.

Budget Activity: Ground Launched Cruise Missile
Program Element: PE64362F/27314F

All test air vehicles will have telemetry packages and range control systems installed. Service personnel, representative of operational personnel, will operate and maintain the weapon system to the extent possible during Initial Operational Test and Evaluation (IOT&E). Because of technical data and support equipment phasing, contractor personnel will perform maintenance on some parts of the weapon system during the first half of IOT&E. A system approach to the evaluation of availability, reliability (both mission and logistics), maintainability, and logistic supportability is a major operational suitability test objective. Quantitative (critical, high interest, and desirable maintenance and operational demonstrations performed by Air Force personnel) and qualitative maintainability evaluations are planned. A qualitative logistics supportability evaluation will be conducted with emphasis on Air Force Logistics Command (AFLC) capability to support the system. Mature system evaluation criteria (thresholds and goals) will be established for significant areas of evaluation. The system effectiveness data system (SEDS) will be used to collect and analyze reliability and maintainability test data. Service reports will be submitted IAW Section V, Technical Order 00-35D-54 (USAF Material Deficiency Reporting and Investigating System). Air Launched Cruise Missile (ALCM) and Sea Launched Cruise Missile (SLCM) program data will be used as appropriate.

f. (U) Operational testing of the Ground Launched Cruise Missile (GLCM) weapon system will continue after Air Force System Acquisition Review Council (AFSARC) III. This Follow-on Operational Test and Evaluation (FOT&E) effort will be accomplished in two phases. Phase I, scheduled to start in June 1983, will be managed by the Air Force Test and Evaluation Center (AFTEC) and conducted to complete evaluations not finished during IOT&E, to refine IOT&E estimates evaluate changes and modifications to correct previously identified deficiencies, and to identify additional deficiencies. Phase II will be conducted by Tactical Air Command (TAC) to refine tactics, techniques, doctrine and training programs; provide for continuing analysis of operational effectiveness and suitability to include changes in operational requirement; and to identify deficiencies and verify the subsequent corrective measures. Phase II is scheduled to begin in the summer of 1984 after the completion of Phase I, and testing will continue throughout the life of the system. This testing will be managed by the Tactical Air Warfare Center (TAWC). Phase II will consist of Continental United States (CONUS) flight tests and ground tests conducted in both the CONUS and at operational bases. The flight test program will eventually grow to 12 flights per year, initially at the Utah Test and Training Range, with most of the air vehicles being recovered, refurbished, and returned to the operational inventory. The remaining air vehicles will be fully operational missiles, altered by blue suit maintenance personnel to remove the warhead and insert a telemetry package. These missiles will be flown full range and are unrecoverable. Launches will be grouped (2 to 4 in a 10- to 20-day period) to maximize use of both airborne and ground based support elements. Ground tests will be used to evaluate equipment modifications and to develop and/or improve operational procedures.

g. (U) There have been no Operational Test and Evaluation (OT&E) reports published to date; however, monthly status reports are being used to identify test events or activities scheduled for the next reporting period and management actions required to complete the test.

Budget Activity: Ground Launched Cruise Missi[illegible]
Program Element: PE64362F/27314F

3. System Characteristics

Physical Characteristic

TOMAHAWK (BGM-109G)	
Length (without booster)	219 inches
Weight	2700 lbs
Warhead (W84)	
Transporter-Erector-Launcher (TEL) (towed by 10 ton M.A.N. Tractor)	
Number of missiles per TEL	4
Approximate TEL weight	78,000 lbs
Launch Control Center (LCC) (towed by 10 ton M.A.N. Tractor)	
Number of TELs controlled by LCC	4
Approximate LCC weight	79,000 lbs

Planned Development Test & Evaluation/Initial Operational Test & Evaluation Flights

Contractor flights completed	3
Air Force flights completed (as of 31 Jan 83)	4
Air Force flights remaining	3
TOTAL	10

Budget Activity: <u>Ground Launched Cruise Missile</u>
Program Element: <u>PE64362F/27314F</u>

<u>Missile Performance</u>

	Goal	Threshold	Demonstrated
Speed (Mach)			
Max Penetration			
Cruise			
Range (Kilometers)	2500	2500	TBD
Penetration Altitude, Smooth Terrain (Feet, above ground level)			
Circular Error Probability (feet)			
Mission Reliability			
Mean Time to repair, *non-missile failures (minutes)*	*60*	*60*	*TBD*

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64601F
DOD Mission Area: #276 - Defensive Chemical and Biological Systems

Title: Chemical/Biological Defense Equipment
Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	9694	16339	15570	14194	Continuing	N/A
3320	Biological Agent Detection	0	100	100	100		
3321	Chemical Agent Detection	3482	4000	7066	5646		
3337	Individual Protection	3935	5600	2300	2100		
3762	Collective Protection	1326	4439	5404	5058		
3764	Decontamination	851	2000	600	1300		
5171	Bigeye	100	200	100	0		

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Air Force needs to performs its mission - to fly and fight - even in a chemically and/or biologically contaminated environment. Our potential adversaries have an offensive chemical and biological warfare capability, against which we cannot currently completely defend ourselves. This Program Element includes RDT&E of means to detect, warn against, protect against and decontaminate personnel and equipment from chemical/biological warfare agents.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
RDT&E	8767	16339	16247		Continuing	N/A

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Other Procurement PE 27593F - Chemical Warfare Defense Equipment						
Related to PE 64601F Project 3321, Chemical Agent Detection						
Surface Contamination Monitor			2500	1100	77400	90900
Quantity			(95)	(600)		

Program Element: #64601F | Title: Chemical/Biological Defense Equipment
DOD Mission Area: #276 - Defensive Chemical and Biological Systems | Budget Activity: #4 - Tactical Programs

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	Automatic Liquid Agent Detector		1000	2000	5600		8600
	Quantity		(800)	(2100)	(5600)		
	Related to PE 64601F Project 3337, Individual Protection						
	Aircrew Eye Respiratory System	3520					
	Quantity	(11000)					
	Aircrew Mask (XM-33)				1500	1600	3100
	Quantity				(5000)		
	Groundcrew Mask (XM-30)		2500	2500	9000	81900	90900
	Quantity		(10000)	(10000)	(36000)		
	Cooling Vest			2000	3000	10000	15000
	Quantity			(1000)	(1500)		
	Fighter Mask				18750	37500	56250
	Quantity				(2500)		
Related to PE 64601F Project 3762, Collective Protection							
	Collective Protection Shelter			16197	33637	840000	890000
	Quantity			(128)	(240)		
Related to PE 64601F Project 3764, Decontamination							
	Lightweight Decontamination System	6411	7695	6100	0	0	20206
	Quantity	(450)	(540)	(420)			

5. (U) RELATED ACTIVITIES: DOD Directive 5160.5 establishes the Department of the Army as Executive Agent for all reseasrch, exploratory development, and advanced development. However, individual service efforts are encouraged to

Program Element: #64601F Title: Chemical/Biological Defense Equipment
DOD Mission Area: #276 - Defensive Chemical and Biological Systems Budget Activity: #4 - Tactical Programs

plan, program, budet, fund and perform exploratory and advanced development when necessary to meet service unique requirements. Air Force programs; Program Element (PE) 27593F, Chemical Warfare Defense Equipment, procurement of equipment developed in PE 64601F; PE 62202F, Aerospace Biotechnology, basic research into biotechnological problems of chemical warfare and PE 64703, Aeromedical Systems Development, PE 63745F, Chemical Warfare Defense. Army programs: PE 62706A, Chemical/Biological Defense and General Investigation; PE 63721A, Chemical Defense Material Concepts; PE 64724A, Biological Defense Material, PE 64725A, Chemical Defense Material. Navy programs: PE 62764N, Chemical/Biological/Radiological Defense Technology; PE 64506N, Chemical/Biological/Radiological Warfare Countermeasures. Tasks are coordinated with the other Services.

6. (U) WORK PERFORMED BY: There are numerous contractors, the top five contractors ($25,000 or more) are Gentex, Carbondale, PA (Project 3337, Individual Protection); Honeywell, Clearwater, FL (Project 3321, Chemical Agent Detection and Project 3764, Decontamination); GTE Sylvania, Mt View, CA (Project 3321, Chemical Agent Detection); Rohm and Haas, Spring House, PA (Project 3337, Individual Protection); and Systems Research Laboratory, Dayton, OH (Project 3762, Collective Protection). There are seven additional contractors, and the total dollar value of the additional contracts is $4,800,000. The in-house developing organization for Projects 3320, 3321, 3337, 3762 and 3764 is Air Force Systems Command's Aeronautical Systems Division, Dayton OH. The in-house management organization for Project 5171 is Air Force System Command's Armament Division, Fort Walton Beach, FL.

7. (U) PROJECTS LESS THAN $10 MILLION 1984:

A. (U) Project 3320, Biological Agent Detection is for full scale development of devices to detect and warn against biological warfare agents. Detectors must be sensitive enough to activate an automatic alarm early enough to take protective measures, but without false alarms. This project supports the Air Force effort to monitor Army Biological Agent Detection efforts.

B. (U) Project 3321, Chemical Agent Detection, develops devices to detect and warn against chemical warfare agents. Detectors must be sensitive enough to activate an automatic alarm early enough to take protective measures, but without false alarms. A production decision for the Automatic Liquid Agent Detector is scheduled for FY 83 while that for Surface Contamination Monitor is scheduled for FY 84. Initiated a Detection and Warning System architecture development that will continue through FY 84. A critical design review of the Area Detection System will be completed in FY 84. Plans to initiate a passive detection system that will improve on the Army's XM-21 detector will be finalized in FY 83.

C. (U) Project 3337, Individual Protection, develops protective clothing and equipment for aircrew, groundcrew and special-team personnel. Items developed must protect individuals from chemical and biological warfare agents and still allow body movements needed without undue personal stress to perform military functions. A redesign of the Integrated Chemical Defense System was initiated in FY 82 and is expected to be completed in FY 83. A production decision on this system is scheduled in FY 84. Test and evaluation of the Aircrew Chemical Defense Protective Hood Blower System resulted in termination of this task. Initial Operational Test and Evaluation on the first generation Chemical Defense Fabric Development is scheduled for completion in FY 84. A demonstration of Liquid Cooling Vests was performed in FY 82. Additional developmental testing of these vests will continue in FY 83.

Program Element: #64601F
DOD Mission Area: #276 - Defensive Chemical and Biological Systems

Title: Chemical/Biological Defense Equipment
Budget Activity: #4 - Tactical Programs

D. (U) Project 3762, Collective Protection. Develops fixed and mobile shelters that protect against chemical and biological warfare agents and against the blast of conventional weapons. Initiate full scale development of collective protective shelter. Operational Test and Evaluation of "off-the-shelf" equipment scheduled for completion in FY 83. Operational Test and Evaluation of "designed-to-cost" equipment scheduled for the first quarter of FY 84.

E. (U) Project 3764, Decontamination develops material, methods and equipment for removing/neutralizing chemical warfare agents without diminishing the capability of aircraft and ancillary equipment. A production decision for the Sanator Lightweight Decontamination System was made in FY 82, and a production contract was let in early FY 83 with deliveries scheduled in later FY 83. Completed flight tests and weathering tests of a sacrificial decontamination coating in FY 83. Additional testing of the sacrificial coating on ground support equipment and aircraft interiors are being planned.

F. (U) Project 5171, Bigeye, insures Air Force compatibility with an improved air-deliverable, binary chemical weapon and evaluation for aircraft certification and safe separation are scheduled for completion in FY 84.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64602F
DOD Mission Area: #233 - Close Air Support and Interdiction

Title: Armament/Ordnance Development
Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

PROJECT NUMBER	TITLE	FY1982 Actual	FY1983 Estimate	FY1984 Estimate	FY1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	26,852	20,148	20,868	21,255	Cont	N/A
2586	Dispenser Munitions	4,947	2,600	900	4,600	Cont	N/A
2708	Aircraft Gun Systems	11,800	3,100	1,500	0	Cont	N/A
2784	Armament Equipment Systems	605	2,148	3,068	3,155	Cont	N/A
3133	Bombs and Fuzes	6,500	5,000	8,800	11,000	Cont	N/A
4535	Fuel Air Explosives, Flame and Incendiary	Program Terminated					
5613	Carriage and Release Equipment	3,000	7,300	6,600	2,500	Cont	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program is the primary source for modernizing unguided air-to-surface conventional weapons and associated equipment. These weapons provide new capabilities to fill operational voids and eliminate deficiencies in current capabilities. These direct attack improvements are absolutely essential since any sustained conflict requires large quantities of these type weapons. The objective of these programs is to provide the tactical and strategic operational forces with an effective conventional weapon operational capability. Activities involve the engineering design, development, test and evaluation of a variety of improved conventional weapons and munitions handling equipment. It includes the following types of weapons/equipment: bomb fuzes; bomblets optimized for use against personnel, materiel, armor and other vehicles; dispensers for bomblets; munitions handling equipment; standardized aircraft release equipment; antiarmor gun pods; and devices to permit supersonic carriage and delivery. The efforts underway or planned in this program can be divided into two categories: those aimed at providing our forces with new capabilities to fill operational voids, and those aimed at eliminating deficiencies in current capabilities. For example, this program develops dispenser munitions which will permit full utilization of aircraft capabilities in terms of low altitude supersonic delivery. Also, there are programs such as bomb fuzing, standardized bomb racks, and munitions handling equipment which will use current technology to provide improved capabilities in terms of safety, reliability, operations flexibility and ease of maintenance. Efforts in this program are completed with formal standardization of the munitions/equipment and with independent assessments by the development and operations communities to the effect that the item has successfuly completed development, demonstrates operational utility and suitability, and is ready for production.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	25,205	20,648	21,776	N/A	Cont	N/A
Procurement (Aircraft)(PE27128/27121)	41,700	29,500	29,400	N/A	Cont	N/A
Procurement (Other)(PE28030)		8,340	163,751	N/A	Cont	N/A

The significant changes resulted from quantity changes and a DURANDAL effort.

Program Element: #64602F
DOD Mission Area: #233 - Close Air Support and Interdiction

Title Armament/Ordnance Development
Budget Activity: #4 - Tactical Program

4. (U) Other Appropriation Funds: ($ In Thousands)

	FY1982 Actual	FY1983 Estimate	FY1984 Estimate	FY1985 Estimate	Additional to Completion	Total Estimated Costs
Procurement (Aircraft)(PE 52610F) (Project # 2708)(Quantity)	43,700 (104)	29,100 (75)	28,100 (80)	Cont (Cont)	Cont	N/A
Procurement (Aircraft)(PE 27133F)(Wpn Sys) (Project # 5613)(Quantity)			28,200 (265)	45,000 (547)	Cont	N/A
Procurement (Other)(PE 28030F) (Project # 2586)(Quantity)		25,000 (172)	90,019 (2,179)	256,884 (9,620)	Cont	N/A
(Project # 3133) (Quantity)			27,910 (25,000)	93,996 (89,000)	Cont	N/A

5. (U) RELATED ACTIVITIES: Items from the advanced development program, Program Element 63601F Conventional Weapons, are selected for continuation into a Full Scale Development under this Program Element. Close liaison is maintained between the services through the Joint Technical Coordinating Group for Munitions Development and through formal coordination with the Department of Defense Armaments/Munition Requirements and Development Committee. The Common Bomb Fuze is a joint Air Force/Navy development. The Navy is lead on the Common Bomb Fuze. The 30 millimeter antiarmor gun pod began as an Independent Research and Development project by General Electric.

6. (U) WORK PERFORMED BY: This program is managed by the Armament Division at Eglin AFB, FL. The major fiscal year 1983 contractors are Dayron Corporation, Orlando, Florida (FMU-130 Fuze); Western Gear Corporation, Jamestown, North Dakota (Multiple Stores Ejector Rack); and General Electric, Burlington, Vermont (30MM Gun Pod). The Naval Air Systems Command, Washington, DC, is managing the FMU-139 program (Motorola Incorporation, Scottsdale, Arizona. There are many other contractors, e.g., small businesses, associated with these efforts.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: 2586 Dispenser Munitions: The purpose of this project is to provide improved unguided cluster bomb dispensers as well as improved submunitions and bomblets. In FY 82 most of the CBU-87 (Tactical Munitions Dispenser loaded with 202 Combined Effects Bomblets) DT&E/IOT&E was completed. In addition engineering and MIL-STD environmental tests, e.g. cold temperature, were also completed. The objective of the FY 83 program is to complete DT&E/IOT&E and make a production decision. Efforts to develop more streamlined dispensers will also continue. In FY 84 dispenser improvement activities will continue and development of a submuniton to set diesel fuel afire will start.

B. (U) Project: 2708 Aircraft Gun Systems: This project consists of the 30mm Gun Pod (GPU-5/A) and its associated support equipment. The GPU-5/A offers a strap-on, cost effective capability against a wide range of targets. In FY 82 DT&E/IOT&E was conducted. Design changes were made to correct design and producibility problems. A total of 104 production gun pods were put on contract. In FY 83 the goal is to buy 75 production pods, complete DT&E/IOT&E on the gun pod, and continue efforts to develop a simplified ammunition loader and associated gun pod equipment. Production deliveries will also continue. In FY 84 development of the ammunition loader and associated gun pod equipment will be complete.

C. (U) Project: 2784 Armament Equipment Systems: This project provides better standardization as well as capability improvements. Better Munition Handling Equipment (MHE), containers, and munitions as well as associated cost savings result. Maximum use of available containers, MHE, and other munition related items is made. A data retrieval system is maintained and efforts to provide improved capabilities are conducted. The goal is to reduce proliferation by taking maximum advantage of prior investments. Container, MHE, and munition focal points direct the program. In FY 82 numerous container and MHE tasks were conducted. In FY 83 and FY 84 the goal is to expand these standardization activities to other munition areas. Example of ongoing activities include an improved bomb assembly system and improved methods to load bombs.

D. (U) Project: 3133 Bombs and Fuzes: The purpose of this project is to develop better bombs and fuzes. In FY 82 development of the FMU-139 Joint Service electronic bomb fuze continued. Initial engineering tests were completed. Development of the FMU-130 impact mechanical fuze also continued. In FY 83 FMU-139 and FMU-130 will continue with assemble and test of additional engineering units. In FY 84 FMU-139 and FMU-130 development will be complete. In addition, development of a proximity sensor for high drag general purpose bombs, a timer for the B-1/B-52, an improved modular fuze, a 500 lb bomb simulator, and an improved general purpose bomb will start. These new capabilities will offer significant operational improvements.

E. (U) Project: 4335 Fuel Air Exposives, Flame and Incendiary: There are no active programs in the FY 82-85 time period. FAE II was terminated in 1981.

F. (U) Project: 5613 Carriage and Release Equipment: The objective of this project is to develop more capable bomb racks, ejectors, and associated handling/release equipment. In FY 82 the Multiple Stores Ejector Rack (MSER), a common bomb rack for the F-16 and F-15, was the only active program. A contract to complete development was awarded to Western Gear. Engineering design on a more streamlined strongback was initated. In FY 83 prototypes will be tested and the decision on releasing long lead production funds will be made. In FY 84 DT&E/IOT&E will be conducted and a production decision will be made. In addition, efforts to make maximum use of MSER's hydraulic ejector on Future Fighter aircraft will continue.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64606F[1] — Title: Joint Tactical Missile System
DOD Mission Area: #223 - Close Air Support and Interdiction — Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING) ($ in Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	2/	23,200[3]	9,920	39,886	TBD	TBD

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides the Full Scale Engineering Development of an air-launched standoff missile for employment from both tactical and strategic aircraft against a variety of key targets. Equipped with a modular munition configuration, the Conventional Standoff Weapon will provide the standoff attack element of a variety of engagement systems including application with the Precision Location Strike System (defense suppression) and the PAVE MOVER Engagement System (second echelon antiarmor). Such a standoff weapon capability is needed to reduce aircraft attrition in the attack of heavily defended targets. This program element directly contributes to the OSD-directed Army/Air Force Joint Tactical Missile System program, which merges the Conventional Standoff Weapon with the Army Corps Support Weapon System (PE 64324A).

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in Thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
RDT&E	2/	38,858	65,708		93,292	197,858

FY 1983 estimates were based on a single-service program. Revised estimates reflect OSD-directed joint program.

4. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Procurement (Missile) Program Element 27167F	0	0	0	0	TBD	TBD

[1]This Program Element is being changed to PE 64324F.
[2]Supported within PE 64742F in FY 1982
[3]In accordance with the FY 1983 Continuing Resolution Amendment these funds will be used for the OSD-directed Joint Tactical Missile System (JTACMS) program, and Precision Location Strike System weapon integration. $6.3M has already been reprogrammed with Congressional Direction to support PAVE TIGER, leaving $23.2M.

Program Element: #64606F
DOD Mission Area: #223 - Close Air Support and Interdiction

Title: Conventional Standoff Weapon
Budget Activity: #4 - Tactical Program

5. (U) RELATED ACTIVITIES: The Conventional Standoff Weapon will be capable, through preplanned product improvements, of effective application with a variety of engagement systems, including the Precision Location Strike System, Program Element 64742F; and the PAVE MOVER Engagement System, Program Element 64616F[1]. The Conventional Standoff Weapon program has been merged with the Army Corps Support Weapon System, Program Element 64324A, in the Joint Tactical Missile System (JTACMS) program, and will be renumbered as PE 64324F.

6. (U) WORK PERFORMED BY: The Joint Tactical Missile System (JTACMS) Joint Program Office will be led by the Army Missile Command, Redstone Arsenal, Huntsville, AL, with an integrated Army/Air Force team. An additional detachment will be located at Air Force Systems Command's Armament Division, Eglin AFB, FL, where the Conventional Standoff Weapon program was managed. Initial Operational Test and Evaluation will be conducted by the Army Operational Test and Evaluation Agency and the Air Force Test and Evaluation Center.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not applicable.

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: Conventional Standoff Weapon

A. (U) Project Description: This program conducts Full Scale Engineering Development of an air-launched standoff missile for application with a variety of engagement systems, as part of the OSD-directed Joint Tactical Missile System (JTACMS) program.

(U) In recent years surface-to-air defenses have advanced markedly. The surface-to-air defenses available to the Soviets and other potential adversaries raises the risk of significant Air Force aircraft attrition per target killed. Operational commanders must rely heavily on defense suppression systems and utilize large tactical forces to insure mission success. This commitment of large numbers of sorties to individual targets limits the overall effectiveness of attack aircraft, particularly during the early stages of an intense conflict. An air-to-surface standoff weapon is needed to reduce the sortie requirements and attrition losses while destroying key targets. Such a standoff weapon should be capable of destroying a variety of targets, including defense suppression, interdiction, and armor. Standoff attack capability is needed not only for potential intense conflicts such as in Europe against Warsaw Pact Forces, but also for use in contingency areas where the B-52 Strategic Projection Force might be used.

(U) The Army and Air Force are developing a Joint Statement of Operating Requirements that will determine the detailed performance specifications for the Joint Tactical Missile System. For the air-launched missile, the initial emphasis will be on application with the Precision Location Strike System (PLSS). The modular design approach, including munition configurations and data link techniques, will enable this initial version to be expanded upon to address the requirements of the Joint STARS system and other engagement systems as preplanned product improvements.

[1] The PAVE MOVER Program is now part of the OSD-directed Joint Surveillance and Target Attack Radar System (Joint STARS), and will be renamed accordingly and renumbered as PE 64770F to conform to Army's PE 64770A.

Program Element: #64606F
DOD Mission Area: #223 - Close Air Support and Interdiction

Title: Conventional Standoff Weapon
Budget Activity: #4 - Tactical Programs

(U) To allow PLSS and other engagement systems to provide accurate guidance update information to the Conventional Standoff Weapon in flight, the air-launched missile will contain a data link transponder capable of receiving and acknowledging the PLSS signals. Compatibility between this data link and the PAVE MOVER signal structure is a program goal.

(U) The air-launched missile will be designed for use with the B-52 and other aircraft, and will provide sufficient standoff to enable delivery aircraft to remain outside the envelope of the principal target area located threats.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: A Request for Proposals for Full Scale Development of the Conventional Standoff Weapon was released, but this request was cancelled after OSD directed the formation of the Joint Tactical Missile System program. Air Force and Army efforts in the balance of FY 1982 focused on the development of the Joint Statement of Operating Requirements, the identification of potential for system commonality, and the development of an acquisition strategy for the common missile system. The DARPA/Army/Air Force Assault Breaker demonstrations at White Sands Missile Range, NM, validated new technology advances in propulsion and missile navigation and guidance.

(2) (U) FY 1983 Program: The Assault Breaker Demonstrations continued to validate advanced technology that applies to the Joint Tactical Missile System, including successful use of precision guided munitions launched against armored targets from standoff range. Full Scale Development, a new start, will be initiated in Fiscal Year 1983 through the release of a Request for Proposals and a competitive source selection. Additional effort will focus on developing concepts of operation, survivability studies, force-on-force analyses, studies of system commonality, and cost estimates.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Funds are requested for FY 1984 to competitively select and award the Full Scale Development Contract for the Joint Tactical Missile System. Preliminary design review will be conducted, and related planning for integrated logistic support, training, and test and evaluation will be done. Appropriate Acquisition Council Review will be conducted.

(4) (U) Program to Completion: Critical design review will be conducted, and subsystem and system tests will be completed for the initial versions of the Joint Tactical Missile System, and procurement will be initiated for a system capable of delivering an anti-personnel/anti-materiel warhead. Preplanned product improvements will be developed and incorporated for application of the missile system with other engagement systems, e.g., Joint STARS.

C. (U) Major Milestones:

Milestones:	Dates
(1) (U) RFP Release	4Q FY 83
(2) (U) Contract Award	3Q FY 84
(3) (U) Preliminary Design Review	FY 1985

Program Element: #64606F
DOD Mission Area: #233 - Close Air Support and Interdiction

Title: Conventional Standoff Weapon
Budget Activity: #4 - Tactical Programs

(4) (U) Defense System Acquisition Review Council II FY 1985
(5) Initial Operating Capability

Milestones differ from FY 1983 Descriptive Summary because of new OSD direction to form the Joint Program.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 64607F
DOD Mission Area: #223, Close Air Support and Interdiction

Title: Wide Area Antiarmor Munitions
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	18,641	13,703	52,159	95,991	Continuing	Not Applicable
2579	Antiarmor Cluster Munition (ACM)	14,091	2,100				TERMINATED
2581	Extended Range Antiarmor Munition (ERAM)	4,550	8,603			TBD	TBD
2582	Wasp		3,000	31,159	59,041	393,964	487,164
2961	Sensor Fuzed Weapon (SFW)			21,000	36,950	12,200	65,150

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Tactical Air Forces require a capability to destroy multiple enemy tanks during a single aircraft pass to overcome the existing large numerical imbalance of Warsaw Pact armor. This critical need is documented in the Mission Element Need Statement for an *Improved Wide Area Antiarmor Capability*. The Wide Area Antiarmor Munition (WAAM) program has been initiated to address this need. It will accomplish full scale development, culminating in production decisions, of the WAAM weapons: the Antiarmor Cluster Munition, the Extended Range Antiarmor Munition, the Wasp missile system, and the Sensor Fuzed Weapon. The Antiarmor Cluster Munition program was terminated in October 1982.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	20,722	8,503	45,701		Continuing	Not Applicable
Procurement (OTHER) (PE 28030F)	16,000	54,412	163,979		1,758,545	1,992,945

(U) The FY 1982 Antiarmor Cluster Munition (ACM) program was restructured to permit more testing and analysis after technical problems were encountered. The restructured program permitted a reprogramming of ACM funds to the Extended Range Antiarmor Munition project within the same PE. Other minor reprogramming was also performed.

(U) The FY 1983 estimate was increased by $5.2 million to continue ERAM and ACM development per Congressional direction. ACM was terminated in FY 1982.

(U) The FY 1984 estimate was increased slightly due to more refined estimating and inclusion of SFW development. Some development funding for the Boosted Kinetic Energy Penetrator (BKEP) submunition is also temporarily included in FY 1984.

(U) FY 1982 procurement funding for ACM was reprogrammed at the direction of Congress. FY 1983 and subsequent years procurement was deleted due to termination of ACM.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

Program Element: # 64607F Title: Wide Area Antiarmor Munitions
DOD Mission Area: #223, Close Air Support and Interdiction Budget Activity: #4, Tactical Programs

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Estimated Costs
Procurement						
Extended Range Antiarmor Munition (OTHER) (PE 28030F)					TBD	TBD
Wasp (Missiles) (PE 27166F)					TBD	TBD
Sensor Fuzed Weapon (OTHER) (PE 28030F)					TBD	TBD

5. (U) RELATED ACTIVITIES: WAAM technology support is ongoing in Program Element 62602F, Conventional Munitions, and Program Element 63601F, Conventional Weapons Technology. Warhead, sensor, seeker, and dispenser technology programs in these program elements provide the basis for the WAAM concepts. Weapon concept demonstration/validation was accomplished in Program Element 63609F Advanced Attack Weapons. Other related Air Force programs can be integrated with WAAM to provide a total wide area antiarmor system capability.

6. (U) WORK PERFORMED BY: Program management is provided by Headquarters, Air Force Systems Command, Andrews Air Force Base, MD and its subordinate organization, Armament Division, Eglin Air Force Base, FL. Contractor support for the Extended Range Antiarmor Munition and Sensor Fuzed Weapon is provided by AVCO Corporation, Wilmington, MA. Hughes Aircraf Company, Canoga Park, CA will provide Wasp full scale development contractor support.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

Not Applicable

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: 2582, Wasp

A. (U) Project Description: Wasp is a missile system that employs a terminal seeker and lock-on-after-launch guidance capability. The Wasp system consists of eight minimissiles contained in an aircraft mounted pod. It can be delivered at minimum altitudes and standoff distances to avoid the severe defensive environment. Wasp will provide the multiple kills per pass capability during all hours and adverse weather conditions.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The Wasp validation program continued with major systems design reviews conducted. In March 1982, Hughes Aircraft Company was selected to continue as the single contractor. Boeing Aerospace was not selected to continue. Over 300 hours of testing was conducted during captive carry flight tests of the critical millimeter wave seeker. The seeker demonstrated an ability to acquire, lock-on, and track armor targets. Considerable refinements were made in the missile design to reduce life cycle cost. The Wasp validation program is conducted under PE 63609F.

Program Element: # 64607F
DOD Mission Area: #223, Close Air Support and Interdiction

Title: Wide Area Antiarmor Munitions
Budget Activity: #4, Tactical Programs

(2) (U) FY 1983 Program: The Wasp validation program will be completed in May 1983. Captive carry flight tests and flight tests of eight live Wasp missiles will be completed. The program will be ready for transition to full scale development in Summer 1983.

(3) (U) FY 1984 Planning Program and Basis for FY 1984 RDT&E Request: Wasp full scale development initial design and development will be the major area of work in FY 1984. The basic missile pod will undergo design and wind tunnel analysis. Continued cost reduction design work on the millimeter wave seeker will be performed. Hughes Aircraft will perform the full scale development program under a fixed price incentive contract. The program cost estimate was performed using engineering buildup (grassroots) estimating techniques.

(4) (U) Program to Completion: The Wasp program will continue in full scale development into FY 1988 and transition into production under PE 27166. Production long lead for Wasp is planned for FY 1987.

C. (U) Major Milestones:

Milestones	Dates
(1) WAAM Milestone I Review	December 1979
(2) Wasp Validation Completion	May 1983
(3) Wasp Full Scale Development Start	June 1983
(4) Milestone II Review	December 1984
(5) Wasp Production Long Lead	FY 1987
(6) Wasp Production	FY 1988

9. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: 2961, Sensor Fuzed Weapon

A. (U) Project Description: Sensor Fuzed Weapon (SFW) is a 1000 pound cluster weapon which consists of a Tactical Munitions Dispenser packaged with 40 armor defeating warhead mechanisms. The warhead mechanism, commonly called "Skeet", consists of a self forging fragment warhead and infrared detector which detects hot areas on the target and initiates the warhead. The smart cluster weapon will provide multiple kills per single aircraft pass.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The Sensor Fuzed Weapon (SFW) program was initiated in FY 1982 as an outgrowth of the Extended Range Antiarmor Munition (ERAM) program and the Assault Breaker project. Basic analysis of this direct strike, smart submunition concept was conducted which revealed a high kill per pass potential for this concept.

Program Element: # 64607F | DOD Mission Area: #223, Close Air Support and Interdiction

Title: Wide Area Antiarmor Munitions | Budget Activity: #4, Tactical Programs

(2) (U) FY 1983 Program: A system demonstration program of SFW will be completed in FY 1983. Live Skeet submunition tests will be performed as well as dispenser testing of the submunition from the dispenser. Live warhead tests and altimeter tests are also planned in the demonstration program.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Sensor Fuzed Weapon (SFW) will begin full scale development in FY 1984. Basic design, development, and test of each of the subsystems will be performed as well as integration into the dispenser. A fixed price incentive contract with AVCO Corporation is planned. A grassroot estimating technique was used in the program cost estimate. The FY 1984 funding also includes some development funding for the BKEP submunition. This effort and the submunition effort under SFW will be shifted to a separate program element for submunition development to insure proper submunition development for all mission areas. Congress will be notified of the details of this new program element when details are complete.

(4) (U) Program to Completion: The Sensor Fuzed Weapon will continue in full scale development through FY 1986. Some advanced procurement effort may be requested in FY 1986 to permit early transition to production in FY 1987. The procurement program element will be PE 28030F.

C. (U) Major Milestones:

Milestones	Dates
(1) Full Scale Development Start	October 1983
(2) Preliminary Design Review	March 1984
(3) DSARC II	March 1985
(4) Critical Design Review	April 1985
(5) Initial Production	October 1986

Budget Activity: Tactical Program, #4
Program Element: #64607F, Wide Area Antiarmor Munitions (WAAM), Wasp

Test and Evaluation Data

1. (U) Development Test and Evaluation:

(U) Validation Phase: Development testing of the Wasp missile in the validation phase is being conducted by the Wasp contractor, Hughes Aircraft Company. Testing in this phase will culminate in Fiscal Year 1983 and lead to the full scale development program starting in Fiscal Year 1984. The major Development Test and Evaluation (DT&E) objectives for the validation phase are to: (1) demonstrate achievement of satisfactory pattern and kill mechanism performance, (2) demonstrate use in a variety of battlefield and countermeasure environments, (3) demonstrate launch concepts, (4) demonstrate the ability of the seeker to discriminate between real and false targets, and (5) evaluate integrated logistics support requirements. Significant test milestones within the validation phase include completion of seeker tower testing in October 1981, completion of captive flight tests (Fiscal Year 1982), and completion of free flight tests (Fiscal Year 1983). Contractor development engineers are conducting the development testing at Eglin Air Force Base, Florida, and at other appropriate test ranges. The Air Force Test and Evaluation Center (AFTEC) is monitoring the validation testing and providing an operational assessment of the weapon system upon conclusion of the testing.

(U) The validation testing to date has included subsystem and component level testing. The major test activities have included both tower tests and captive carry tests of the millimeter wave seeker. This testing has demonstrated the ability to acquire, lock-on, and track various targets under different clutter backgrounds. No significant deficiencies have been identified to date.

(U) The hardware being tested in the validation phase are advanced engineering or breadboard models. Their physical sizes and functions are representative of the items to be tested in later stages of development and production; however, production processes and manufacturing techniques are not normally used for the validation hardware. All systems will be tested in the validation phase with the exception of the pod which will be demonstrated and tested in full scale development. Warheads will not be tested on the flight missiles; however, warhead capability will be tested in other test arenas.

(U) The Wasp contractor plans to rail launch eight missiles in the validation program. This testing will provide valuable insight into system reliability and allow concentration on items which might require further reliability improvement. The reliability goal for the Wasp system is 0.95. Careful attention will also be given to logistics supportability in the validation testing. Environmental testing in this phase is being done at the component/subsystem level. Full environmental qualification testing is scheduled for the full scale development program.

Budget Activity: Tactical Programs, #4
Program Element: #64607F, Wide Area Antiarmor Munitions (WAAM), Wasp

(U) Full Scale Development: Development Test and Evaluation (DT&E) will be combined with the Initial Operational Test and Evaluation (IOT&E). The majority of DT&E will be conducted by the Air Force Systems Command Armament Division. Some subsystem tests, environmental tests, and military qualification tests will be conducted by the contractor at his facility. The Wasp DT&E testing is scheduled to be conducted during Fiscal Years 1986 and 1987. The primary test objectives for the phase are to: (1) establish baseline system performance characteristics, (2) verify the predicted number of kills per pass against specified targets, and (3) to determine the effect of probable countermeasures on system performance. An assessm. of the system support concept in meeting logistics requirements will be made. The Air Force Test and Evaluation Center will have the overall management responsibility for the IOT&E program and their effort is discussed in paragraph 2 below. The combined DT&E/IOT&E program will include approximately 19 Wasp pod equivalents with each pod containing 8 missiles. As with the validation testing, the majority of the DT&E/IOT&E will be conducted at Eglin Air Force Base; however, other test ranges such as those in Utah and Alaska are likely to be used.

(U) The DT&E/IOT&E hardware will be very similar, if not identical, to the planned production hardware. Many of the planned production processes will be used to manufacture the test hardware. All systems including the pods and warheads will be tested in this phase. System reliability, availability, and logistics support will be tested during this phase.

2. (U) Operational Test and Evaluation:

(U) Initial Operational Test and Evaluation - Phase One (IOT&E(1)) is conducted prior to Milestone II. The Air Force Test and Evaluation Center (AFTEC) monitors contractor Demonstration and Validation and early full scale development (FSD) testing. IOT&E - Phase Two (IOT&E(2)) is conducted after Milestone II, during later FSD, using dedicated AFTEC test items and resources.

(U) Demonstration and Validation Phase: Critical component and submunition tests will be conducted during this phase. The Air Force Test and Evaluation Center will actively participate in the Demonstration and Validation testing to determine, as much as possible, the projected operational effectiveness and suitability of each concept tested. The objective of IOT&E(1) is to determine the expected kills per pass of Wasp when used in a realistic environment. This will be accomplished primarily by evaluating computer simulation and component test data. Most tests will be conducted by contractor personnel at contractor facilities. The remaining tests will be conducted by Air Force Systems Command personnel at Eglin Air Force Base, Florida.

Budget Activity: Tactical Programs, #4
Program Element: #64607F, Wide Area Antiarmor Munitions (WAAM), Wasp

(U) Full Scale Development: IOT&E(2) will be conducted by Air Force Test and Evaluation Center during full scale development with Development Test and Evaluation (DT&E) and IOT&E(2) events combined where feasible. Separate IOT&E(2) will be conducted for operational test and evaluation objectives which cannot be combined with DT&E. Combined and separate IOT&E(2) will be conducted during Fiscal Years 1986 and 1987. Common IOT&E(2) objectives for operational effectiveness during this phase are: (1) measure the expected number of kills per pass against armored company arrays, (2) estimate performance in various battlefield and countermeasure environments, (3) estimate the ability of Wasp to accurately discriminate between real and false targets, (4) estimate operational reliability, and (5) estimate the effect of target location error. An objective unique to Wasp is to measure its ability to lock-on after launch. The operational suitability objectives include determining the maintainability, reliability, and logistics supportability of the systems. Wasp requires a ten year shelf-life which presents a unique suitability issue to be evaluated during IOT&E(2). Test assets used during DT&E/IOT&E(2) will be soft tooled items which are representative of production items. Test assets programmed for separate IOT&E(2) include sixteen pods with eight missiles per pod. At this time specific subsystems and support equipment requirements have not been identified. Test program requirements for Wasp will be defined as more data become available.

(U) The Air Force Test and Evaluation Center will have the overall management responsibility for the IOT&E program. Specific test locations for Wasp have not been determined; however, it is likely that the Eglin Air Force Base land range will be the primary test site. Due to the large expected footprint required by the Wasp kill mechanism, safety will probably be a prime consideration in test range selection. Test ranges will be selected when warhead characteristics are defined.

(U) Preliminary IOT&E planning, including the Test and Evaluation Master Plan and the test concept, has been accomplished. Air Force personnel will operate and maintain the Wasp system throughout IOT&E.

3. (U) System Characteristics:

(U) Characteristics for the Wasp system will be definitized during the validation phase. The primary objective of the program is to develop a system that can achieve multiple kills per pass against massed armor targets. Specific thresholds for the Wasp system will be identified before the Defense System Acquisition Review Council II review.

	Characteristic	Objective (Goal)	Demonstrated
(U)	Reliability	0.95	To be determined
(U)	Minimum Release Altitude	200 ft (60m)	To be determined
(U)	Service Life	2 years	To be determined
(U)	Defeat Capability	Latest Soviet Threat	To be determined

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64608F — Title: Close Air Support Weapon Systems
DoD Mission Area: #233 - Close Air Support/Battlefield Interdiction — Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	22,676	4,412	1520			194,241
2551	Imaging Infrared	12,370	4,412	1520			171,735
2676	Infrared Attack Weapon System (IAWS)	10,306					22,506

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The USAF and USN must be able to successfully attack small hard fixed and mobile targets such as tanks, armored vehicles, bunkers, and small ships during night and adverse weather. The AGM-65 family of Maverick missiles is being expanded to fill this need. The current deployed television model, AGM-65 A/B, provides an excellent daytime capability against tanks and other similar targets but is not suitable during night or adverse weather. Modular infrared and laser guidance units and an alternative warhead are completing development to fill this need. Specifically, the Air Force as executive agency for the Maverick program is developing: (1) a laser guided Maverick for Marine Corps use; (2) an Imaging Infrared seeker and guidance unit for Air Force and Navy direct attack missiles; and (3) alternate warhead to expand the Maverick target spectrum. The imaging infrared seeker will also be used on the GBU-15 data link weapon. The laser guided Maverick and the Navy version of the IR Maverick are funded by the Navy.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
RDT&E	24,906	5,412	570			222,491
Procurement	235,201	353,100	468,700		3,563,799	4,620,800

(U) The FY 83 Descriptive Summary included Alternate Warhead and Aircraft Integration projects. This work is now complete.

(U) Production cost estimates for FY 84 and out have increased due to: (1) a production schedule stretchout to assure reliability in production, (2) technical complexity and developmental design changes, and (3) fact-of-life escalation rate changes. FY 83 funding was reduced to accommodate a lower quantity and a Congressional cut.

Program Element: #64608F   Title: Close Air Support Weapon Systems
DoD Mission Area: #233 - Close Air Support/Battlefield Interdiction   Budget Activity: #4 - Tactical Programs

4. (U) OTHER APPROPRIATION FUNDS:

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Missile Procurement	222,161	248,900	349,783	720,124	4,137,232	5,678,200
Quantity	200	900	2,600	5,729	51,235	60,664

5. (U) RELATED ACTIVITIES: The Tri-Service laser seeker developed under this program is being used in the Marine Corps Laser Maverick missile program. The common infrared seeker subassembly is being developed for GBU-15, the Air Force and Navy versions of the IR Maverick. The Navy is funding both the Laser Maverick and their version of the IR Maverick. The Navy currently plans to employ the Maverick with their A-4, A-6, F/A-18 and AV-8B. The Air Force plans to employ the imaging infrared Maverick with A-7, A-10, F-4, F-16, and F-111 aircraft. The imaging infrared Maverick missile has also been designated as the primary antiarmor weapon system to be employed with the Low Altitude Navigation Targeting Infrared System for Night (LANTIRN). Future infrared seeker developments for this class of weapons are required by the Office of Secretary of Defense to maintain compatibility with the Maverick. An example of this, is the Army's work on focal plane array technology for the next generation of infrared Hellfire missiles. The Hellfire infrared seeker is required to be compatible with the Maverick missile thereby eliminating duplication of effort by the Army and Air Force in focal plane array infrared technology.

6. (U) WORK PERFORMED BY: This program element is managed by the Aeronautical Systems Division, Wright-Patterson AFB, OH. The Armament Division, Eglin AFB, FL is the Responsible Developmental Test Organization and the Air Force Test and Evaluation Center, Kirtland AFB, NM serves as the Operational Test Agency. Prime contractors are Hughes Aircraft Corporation, Canoga Park, CA, and Rockwell International Corporation, Anaheim, CA.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable.

8. (U) PROJECTS MORE THAN $10 MILLION IN FY 1984:

(U) Project: 2551 Imaging Infrared IIR Maverick

A. (U) Project Description: This project was established to develop improved capability for air-to-surface missiles for use against the massive armor threat of the Warsaw Pact. Included in this project is completion of remaining development work and continued production of the IIR Maverick missile.

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: The Combined Development Test and Evaluation/Initial Operational Test and Evaluation Program was completed. Testing was conducted under the conditions at Eglin AFB Florida; Ft Riley, Kansas;

Program Element: #64608F | Title: Close Air Support Weapon Systems
DoD Mission Area: #233 - Close Air Support/Battlefield Interdiction | Budget Activity: #4 - Tactical Programs

Camp Drum, New York; Utah Test and Training Range and the Naval Weapon Center at China Lake, California. Testing demonstrated the IIR Maverick is effective with a probability of kill of under realistic operational conditions. Based on operational test results, analysis shows by employing the IIR Maverick there is a improvement in operational effectiveness of the A-10 and a improvement in operational effectiveness of the F-16 in close air support and battlefield introduction scenarios. The Under Secretary of Defense for Research and Engineering reviewed the IIR Maverick program September 1982 leading to a decision to start pilot production.

(2) (U) FY 1983 Program: Continue the low rate IIR Maverick production. The Request for Proposal for a second IIR Maverick production source was released. The SPO is planning to be on contract by June 1983. This contract will qualify the second source contractor to build IIR missiles.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Continue low rate production of IIR Maverick missiles. In addition, production tooling will be increased to allow the contractor to achieve more economical production rates. Qualification of the IIR Maverick second source will be completed.

(U) Cost estimates were developed using a grassroots methodology. Two independent analyses validated these estimates in June 1982. A key feather in cost reduction and control is competition generated by the second production contractor combined with multiyear procurement.

(4) (U) Program to Completion: IIR Maverick production will be ramped up to achieve an optimum rate. The second source will produce 500 missiles in a directed pilot production program in FY 85 with actual competition starting in FY 86. Multiyear procurement will start in FY 87 with the program being completed in FY 1990.

C. (U) Major Milestones:

	Milestones		Date
(1)	Defense Systems Acquisition Review Council II		Sep 76
(2)	European Test Complete		Feb 78
(3)	Full Scale Development Initiation		Oct 78
(4)	Critical Design Review		Jun 80
(5)	Complete DT&E/IOT&E	(Feb 82)	Aug 82
(6)	Milestone III Production Decision	(3Q FY 82)	Sep 82
(7)	Release Second Source RFP		Oct 82
(8)	Initiate Second Source Contract		Jun 83

(U) Explanation of Milestone Changes:

(5) Testing slipped due to test aircraft availability problems.
(6) Production decision slip caused by delay of test completion.

Budget Activity: Tactical Programs, #4
Program Element: #64608 (Close Air Support Weapons Systems)

(U) Test and Evaluation Data

1. (U) Development Test and Evaluation: The Imaging Infrared (IR) Maverick AGM-65D weapon system is being developed for 24 hour operation to counter the threat of an existing enemy force which has the capability to operate offensively at night and under poor visibility conditions. It will provide enhanced capability during light fog, haze, smog, and dust because of its longer wave-length sensitivity by exploiting the thermal signature of the target. As a member of the Maverick missile family, the infrared Maverick improves the "launch and leave" capability of the AGM-65 and retains the demonstrated system reliability, high single-pass kill probability and flexibility of employment. The infrared missile uses the existing television missile, AGM-65A/B, mounting provisions.

(U) Background Engineering Tests

(U) General. The concept of an imaging infrared guidance system was evaluated by the Night Owl studies in 1970 and 1971. From this study, the Imaging Infrared Guidance and Control Sections were developed. Various designs have been extensively tested from 1973 to present time. The test results are in the following paragraphs.

(U) Captive Flight Tests. A captive test program was flown during 1974 using hardware developed from the studies. Targets for these sorties were tanks, vehicles, ships and radar sites. The results of the captive flight test demonstrated the system's aim point and tracking capability. The results quantified detection and lock-on ranges as well as the atmospheric effects on performance and established the base for design improvements. A follow-on captive flight test program was conducted in 1975. The targets included power plants, hangarettes, and special radar targets. Like first captive tests, these tests were flown at locations throughout the United States, including New Mexico, the northern Gulf Coast of Florida, and southern California. These tests further quantified detection and lock-on ranges and the atmospheric effects on performance. An infrared Countermeasure Static Test was performed in conjunction with the follow-on captive flight tests. These tests were performed by the Office of the Test Director for Joint Service Guided Weapons Countermeasures Test Program at White Sands Missile Range. The objectives of these tests were to determine the susceptibilities and limitations of seeker and guidance units in a countermeasures environment. The static test results provided a data base sufficient to evaluate the missile's susceptibility to countermeasures for future flight tests.

Budget Activity: Tactical Programs, #4
Program Element: #64608, (Close Air Support Weapons Systems)

(U) Free Flight Demonstration. The Free Flight Advanced Development Program was conducted at Eglin Air Force Base, Florida, from July 1975 - December 1975. The objectives of this program were to:

Evaluate the seeker's ability to maintain target lock-on during launch transient.

Evaluate the missile's tracking capability after launch.

Evaluate the missile's capability to hit typical close air support targets.

Obtain data on seeker/missile system performance.

A total of 57 sorties were flown during this evaluation. Four missile launches were accomplished. Three of the four resulted in hits. Launch four missed the target due to a tracker design deficiency. This problem has been corrected by incorporation of a digital centroid tracker.

(U) European Tower Tests. During February and March 1976, the Imaging Infrared Guidance units were statically tested at Grafenwohr, Germany, in conjunction with the Army's Phase II Imaging tests. A television Guidance unit was used during this test to obtain comparison data between the guidance units during low visibility daylight conditions. The performance of the infrared guidance unit was assessed qualitatively against tactical close air support targets under European atmospheric conditions. Test data obtained showed good correlation with infrared guidance unit data, target signature data, meterological data and spectral transmission data from previous test programs. The Infrared Guidance and Control Section showed enhanced target detection over television in degraded visibility conditions.

(U) Digital Centroid and Terminal Correlation Tracker Demonstration. In late 1975, a new tracker for Infrared Maverick was developed. This tracker uses digital centroid tracking for long ranges and correlation tracking at terminal ranges. Helicopter flight tests were conducted in February 1976 at Camp Pendleton, California. The purpose of using a helicopter test aircraft was to permit better investigation and evaluation of the terminal correlation portion of the guidance unit while simulating the trajectory of the missile. The objective of this test was to demonstrate the feasibility of the tracker concept and to obtain as much development data as possible. Small tactical targets as well as large stationary targets were used. These tests were very successful and verified the engineering development tracker design.

Applications Tests. During May and June 1976, tests were conducted in Florida to demonstrate operational applications of the Infrared Maverick weapons system. The objectives of this evaluation were to demonstrate the autonomous night capability of the system against large prebriefed targets, to demonstrate the capability of Infrared Maverick to detect and attack targets during daylight hours when television weapons are limited (fog, haze, dust, limited contrast), and to demonstrate capability against a wide variety of tactical target such as camouflaged vehicles and multiple targets in the field-of-view.

Budget Activity: Tactical Programs, #4
Program Element: #64608, (Close Air Support Weapons Systems)

(U) Infrared Maverick Helicopter Tracker Tests. Tests of the digital tracker were conducted in December 1977 at Camp Grayling, MI and in January at Ft Polk, LA. The tracker was mounted on a helicopter. Tests at Camp Grayling were used to verify and optimize the digital tracker and to obtain data against targets in a snow environment. The digital showed a significant improvement over the previous analog tracker.

(U) Phase I, Development Test and Evaluation Program

(U) Infrared Maverick Helicopter Tracker Engineering Development Program. Phase I of the tracker development testing was conducted during July 1979 to February 1980 as part of the engineering development program. Testing was conducted using an advanced development guidance unit and developmental tracker hardware mounted on a helicopter. The main objectives were to: (1) provide a test bed for developing, refining, and evaluating tracker software algorithms and (2) to obtain additional video data for tracker software development of Maverick and glide weapons. The following chart summarizes Phase I of helicopter testing:

(U) Phase I, Engineering Development Helicopter Tracker Tests

DATA	LOCATION	ACCOMPLISHMENTS
July/August 1979	Dugway Proving Grounds	Tanks and gunflash signature data in hot/dry climate, uncluttered desert background
November 1979/January 1980	Eglin Air Force Base, FL	Tank and gunflash signatures in humid climate, low-medium clutter
January 1980	Redstone Arsenal	T-62 tank and T-62 tank simulator signature comparison, low and high thermal heating, low-medium clutter
February 1980	Ft Riley, KS	Armor and tank gunflash signatures in winter (snow) weather, low-medium clutter

(U) Phase II Development Test and Evaluation Program

(U) Phase II Combined Test Description. The Infrared Maverick Full Scale Development model missile was evaluated in a combined test program conducted in accordance with Air Force Regulation 80-14. This program began July 1980

Budget Activity: Tactical Programs, #4
Program Element: #64608, (Close Air Support Weapons Systems)

and was completed Aug 1982. It involved the launch of 14 missiles and included 115 captive flights. All test missions (captive and launch) were flown by Air Force personnel. The results of these tests are:

(U) Demonstrated capability in limited visibility and night operations.

(U) Demonstrated lock-on and tracking capability.

(U) Demonstrated accuracy and trajectory characteristics within the specified launch envelope.

(U) Demonstrated military operational effectiveness.

(U) Fourteen missiles were launched and 115 captive carry sorties were flown during this test to satisfy primary objectives. Air Force evaluation is based on comparison of test results against Air Force specified test parameters defined in the Weapon Systems Specification. These tests demonstrated compliance of delivered hardware with contractual performance requirements and evaluated missile capabilities in various day/night environments against tactical targets. Missile captive flights and launches were supported with extensive computer simulation of each launch condition and post mission comparison of test results with predicted results. Special emphasis was placed on obtaining airborne and ground thermal measurements of each target/background scenario. These data were used to characterize each scenario and mission profile with respect to observed target/background. Extensive atmospheric weather measurements were made during each captive-carry and free flight mission to provide a data base for evaluating the performance of the system during varying weather conditions. An assessment of adverse weather capabilities of the infrared missile was based upon data gathered at three different test locations over a wide spectrum of climatic conditions.

(U) Special emphasis was placed upon exercising the infrared system during the winter months and under realistic tactical employment conditions. The data gathered from captive-carry and free-flight testing was subject to the limitatior imposed by range and test safety constraints. Therefore, a supplemental adverse weather assessment is planned. The program will involve tower testing of an infrared missile over an extended period of varying atmospheric conditions. The objective will be to study and quantify the acquisition and lock-on performance of the infrared system.

(U) Development Test and Evaluation, Objectives and Results

(U) Development Test and Evaluation. Flight Test Objectives. Air Force Development Test and Evaluation objectives were satisfied by accomplishing a combination of helicopter, captive-flight, and free flight (launch) testing.

(U) Helicopter Test Results:

(U) Demonstrated terminal tracking characteristics of the missile against tactical targets and backgrounds in a broad spectrum of atmospheric conditions.

Budget Activity: Tactical Programs, #4
Program Element: #64608, (Close Air Support Weapons Systems)

(U) Gathered data on tactical target signatures, characteristics, and backgrounds.

(U) Demonstrated tracker performance.

(U) Captive Flight Test Results:

(U) Verified missile, launcher and carrier aircraft electrical and mechanical compatibility in a prelaunch environment.

(U) Demonstrated weapon system ability to meet specification requirements in terms of target acquisition, operational modes, missile lock-on and tracking capability against targets at or above the specified size and temperature differential in a variety of low to high cluttered backgrounds.

(U) Determined that missile and subsystem captive flight environment effect (temperature, vibration, pressure, humidity, sun exposure, etc.) did not degrade performance.

(U) Demonstrated successful missile video output (display).

(U) Demonstrated the accuracy of missile boresight and missile slaving.

(U) Collected failure data for support of reliability and maintainability analysis.

(U) Demonstrated compatibility with the electromagnetic environment of the carrier aircraft.

(U) Demonstrated that human performance factors in the operation of the system were accepatable.

(U) Free-Flight Launches:

(U) Demonstrated the ability of the missile to maintain lock-on from launch to impact during day or night against a variety of specified targets in differing atmospheric conditions and backgrounds.

(U) Verified and demonstrated that the system meets the following requirements:

(U) Acoustical noise and vibration

(U) Missile operating envelopes

(U) Tracking capability

Budget Activity: Tactical Programs, #4
Program Element: #64608, (Close Air Support Weapons Systems)

(U) Acquisition capability

(U) Preparation and missile ready time

(U) Probability of hit

In addition to the flight test program, the Air Force conducted environmental, electromagnetic, reliability, and acceptance testing of the infrared Maverick missile.

(U) Summary of Results. Development testing was conducted against realistic targets in various backgrounds. Specifically, tanks and Armored Personnel Carriers were attacked under dust and desert conditions at Utah Test and Training Range, high humidity and foliage conditions at Eglin AFB and snow conditions at Ft Drum. The testing demonstrated compatibility with PAVE PENNY, PAVE TACK and Wild Weasel acquisition aids. Testing was conducted with A-10, F-4E, F-111, F-16 and F-4G aircraft. Results of these tests showed the IR Maverick met specification requirements and demonstrated required operational effectiveness.

2. (U) Background Operational Testing

(U) Ft Polk Evaluation. An IR Maverick Joint Operational Test and Evaluation (JOT&E) was conducted during February 1977 on the Ft Polk Military Reservation, Louisiana. The Air Force, as Executive Serice by direction of Under Secretary of Defense (Research & Engineering), conducted the test jointly with the Army and Navy. The JOT&E, managed by the Air Force Test and Evaluation Center (AFTEC), consisted of captive-carry and simulated launch of advanced development IR Maverick guidance units against close air support and interdiction scenario armor target arrays. A-7 and A-10 aircraft provided by the Tactical Air Command (TAC) were used in an environment representative of mid-intensity conflict in Central Europe. The test of two missiles was intended to be a short-term effort to gather specific data required to address identified uncertainties. Accordingly, certain areas of operational effectiveness, maintainability, and reliability were not addressed. GCS maintenance was provided by the contractor.

(U) Conclusions from the Ft Polk JOT&E indicated that:

(U) Valid targets can be selected from a target array containing substantial thermal clutter;

(U) Current tactics, procedures, onboard navigation systems, and visual battlefield activity provide sufficient cueing information for target area acquisition and target detection; and

(U) The IR Maverick can be effectively employed from single seat aircraft.

Budget Activity: Tactical Programs, #4
Program Element: #64608, (Close Air Support Weapons Systems)

(U) European Testing

(U) European Testing. A second operational test program, the IR Tracker European Test and Evaluation, was conducted by AFTEC in Jan-Feb 1978 to address Congressional concerns on seeker deficiencies in target acquisition, lock-on, and discrimination that surfaced as a result of the JOT&E and to furnish more substantive data on the proposed centroid tracker.

(U) The overall objective of this test program was to evalute the IR GCS with the digital centroid/terminal correlation (DCTC) tracker operation in European weather conditions with respect to the following:

(U) On-Range Testing.

(U) Objective 1. Assess aircrew ability to transition from navigation to the attack mode, given Initial Point (IP) departure, using forward air controller, PAVE PENNY, inertial navigation system, or simulated PAVE TACK pathfinder as target area cueing aids.

(U) Objective 2. Assess the ability of the IR tracker system to launch at a valid target, given attack mode.

(U) Objective 3. Assess the capability of the IR tracker to maintain lock after launch to point of minimum descent altitude.

(U) Off-Range Testing.

(U) Objective 4. Assess the ability of the IR tracker system to initially lock-on, given line-of-sight to the assigned target.

(U) Objective 5. Assess the capability of the IR tracker to maintain lock to minimum descent altitude after initial lock-on or final relock after inadvertent breaklock against the assigned target.

(U) Both On-Range and Off-Range Testing.

(U) Objective 6. Assess the survivability of the A-10 and F-4 during weapons delivery.

(U) Objective 7. Assess the effects of inadvertent IR countermeasures on system effectiveness.

(U) Objective 8. Compare thermal image appearance and thermal measurements of various vehicle targets.

(U) Since both of the DCTC trackers used in the test were hand-built advanced development models, and were entirely maintained by the contractor, no suitability objectives were addressed.

Budget Activity: Tactical Programs, #4
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(U) The entire test was conducted in West Germany with TAC A-10 aircraft and aircrews and US Air Forces in Europe (USAFE) F-4 aircraft and aircrews operating out of Ramstein Air Base to the Baumholder Military Training Area.

(U) European Test Results

(U) Reinforced the JOT&E results.

(U) Demonstrated that the IR seeker, employed as the guidance medium for GBU-15 and Walleye weapons, is tactically feasible under both day and night conditions, and offers significant enhancement of the tactical performance of both weapons.

(U) Initial Operational Test and Evaluation

(U) Initial Operational Test and Evaluation Description. Initial operational test and evaluation (IOT&E) of IR Maverick. IOT&E as originally planned was completed on 26 August 1982. The IOT&E was managed by AFTEC, with participation of TAC, Air Force Logistics Command (AFLC), Air Weather Service (AWS), Air Training Command (ATC) and US Army. Test Missiles were full scale engineering development hardware. IOT&E accumulated 291 captive carry hours on the A-10, F-16, F-4G, F-4E, and F-111F aircraft. Twelve launches were performed during testing at Ft Riley, Kansas; Eglin AFB, Florida; Ft Drum, New York; China Lake, California; and the Utah Test and Training Range.

(U) These critical issues were addressed during IOT&E:

(U) The adverse weather capability of the IR Maverick weapon system.

(U) The integration of the missile system with the aircraft and aircraft target acquisition aids to provide a weapon system of high utility in target acquisition and target handover from acquisition aids to the missile system.

(U) Validation of general Maverick missile launch condition flexibility, launch standoff range capability, and missile performance with the IR guidance and control section.

(U) Validation of visual day/night single seat attack capability.

(U) Validation of the use of PAVE PENNY cueing for day/night single seat attack in visibility conditions beyond the visual target acquisition range of the pilot.

(U) Validation of use with PAVE PENNY, PAVE TACK and Wild Weasel acquisition aids.

(U) The operational suitability of the IR Maverick.

Budget Activity: Tactical Programs, #4
Program Element: #64608, (Close Air Support Weapons Systems)

(U) IOT&E Preliminary Results:

(U) A formal test report will be published in late 1982, but the following preliminary evaluations are available:

(U) The IR Maverick proved more capable in adverse weather than present electro-optical systems.

(U) The IR Maverick is interoperable and compatible with all aircraft and systems tested.

(U) The missile provides a night attack capability not currently available and a greatly increased standoff capability both day and night.

(U) The IR Maverick proved effective on single seat aircraft both day and night.

(U) PAVE PENNY cueing was effective both day and night.

(U) PAVE TACK and Wild Weasel acquisition systems were highly effective with the IR Maverick.

(U) Performance of the IR Maverick was below established thresholds in all major areas of operational suitability.

(U) Future Testing.

(U) A reliability/maintainability validation program (RMVP) will be conducted November 1982 through February 1983. The RMVP will accumulate another 100 captive carry hours to assess any improvement in operational suitability performance.

(U) An FOT&E, still to be finalized, will be conducted late in FY84.

(U) Test Reports Published:

(U) IIR Maverick JOT&E Report, Jul 77; Confidential.

(U) IIR Tracker European Test and Evaluation Final Report, Sep 78; Confidential.

(U) Countermeasure Static Field Testing of the IR Maverick Seeker, 2 Jun 81; Confidential.

(U) IR Maverick Seeker Development Test and Evaluation Electro-Optical Countermeasures Field Testing, 29 Apr 82; Confidential.

Budget Activity: Tactical Programs, #4
Program Element: #64608, (Close Air Support Weapons Systems)

3. (U) The IR Maverick missile has demonstrated the following major performance characteristics. Results are based on all DT&E and IOT&E testing.

	Approved Program	Demonstrated Performance	Current Estimate
Maximum Launch Range (ft)			
Accuracy (probability of hit)			
Missile Mission Reliability			

Program Element: #64614F

DOD Mission Area: #223 Interdiction/Naval Strike

Title: Medium Range Air-to-Surface Missile

Budget Activity: #4 Tactical Programs

1. (U) RESOURCES ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	47,053	42,682	21,901	13,410	8,537	147,583

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Air Force and the Office of the Secretary of Defense agree that there is a need for an air-launched conventional standoff missile capable of being employed against tactical targets by aircraft of the Strategic Air Command and the Tactical Air Forces. This standoff missile is needed to destroy well protected, high value targets rapidly while minimizing the exposure of launch aircraft to the massive quantity of current and projected enemy lethal air defense systems. Air Force analysis concluded that the optimum solution to this need, based on range, payload, survivability, growth potential and technical risk assessment, would be met by a subsonic, low flying cruise missile system.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY ($ in thousands):

RDT&E	48,916	42,682	23,045	-	23,197	151,840
Procurement	0	0	0	-	0	0

- RDT&E

  -- $1.8M reprogrammed in FY 1982 and revised inflation indices

- Procurement

  -- Procurement not funded in FY 1983 Descriptive Summary. Current program initiates procurement in FY 1986

4. (U) OTHER APPROPRIATIONS ($ in thousands):

Missile Procurement	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Funds	0	0	0	0	TBD	TBD
Quantities	0	0	0	0	TBD	TBD

Program Element: #6/614F
DOD Mission Area: #223 Interdiction/Naval Strike

Title: Medium Range Air-to-Surface Missile
Budget Activity: #4 - Tactical Programs

5. (U) RELATED ACTIVITIES: This development is supported by related developments in the Sea Launched Cruise Missile (PE 64367N), Air Launched Cruise Missile (PE 64361F) and the Ground Launched Cruise Missile (PE 64362F) programs. The Tomahawk airframe, navigation, guidance and mission planning systems were developed under these program elements. Additionally, the Midcourse Guidance Demonstration Project under PE 63601F, Conventional Weapons Technology is employing Tomahawk to flight test new lower cost guidance concepts which will be applied to the Medium Range Air-to-Surface Missile. The Navy portion of this development effort has been conducted under PE 63369N. Candidate submunitions for the Medium Range Air-to-Surface Missile are also being tested under the Office of the Secretary of Defense Foreign Weapons Evaluation program, PE 65111D.

6. (U) WORKED PERFORMED BY: The airframe for the Medium Range Air-to-Surface Missile is manufactured by the General Dynamics Corporation, Convair Division, San Diego, California, and the guidance system integrator is McDonnell Douglas, Astronautics Division, St Louis, Missouri. The missile turbojet engine is produced by Teledyne Continental Aircraft Engines, Toledo, Ohio. Inertial Navigation System components are being developed by Singer-Kearfott, Little Falls, New Jersey, and Litton Industries, Woodland Hills, California. Major development agencies for the missile are the Air Force's Armament Division, Eglin AFB, Florida and the Naval Weapons Center, China Lake, California. A number of other commercial and governmental agencies will be involved in subsystem design, development and testing as the development progresses.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. (U) MRASM (SINGLE PROJECT OVER $10 MILLION IN FY 1984):

A. (U) Project Description: The Medium Range Air-to-Surface Missile program was initiated as a joint Service [illegible] gram in FY 1979 at Congressional direction to develop a weapon system to meet the Air Force and Navy requirements [illegible] standoff attack of high value targets. The Air Force version of the Medium Range Air-to-Surface Missile, AGM [illegible] the primary mission of airfield attack. For this purpose, it is fitted with a dispenser warhead section wh[illegible] specialized runway cratering submunitions. Primary Air Force launch aircraft for the Medium Range Air-to-[illegible] Missile will be Strategic Air Command B-52G bombers and secondary launch aircraft will be F-16 fighters [illegible] Air Forces.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Preliminary and Critical Design Reviews of the [illegible] Missile were completed. Initiated integration studies of the Medium Range Air-to-Surf[illegible] craft. Continued development and testing of the Boosted Kinetic Energy Penetrator and [illegible] submunitions and associated dispenser. Tactical Airfield Attack Munition development [illegible] technical difficulties. Submunition down-selection was rescheduled for FY 19[illegible].

Program Element: #64614F

DOD Mission Area: #223 Interdiction/Naval Strike

Title: Medium Range Air-to-Surface Missile

Budget Activity: #4 - Tactical Programs

(2) (U) FY 1983 Program: Complete system integration of the Air Force version of the Medium Range Air-to-Surface Missile. Continue integration studies of the Medium Range Air-to-Surface Missile with the B-52G aircraft and weapon delivery systems. Down-select to one runway cratering submunition and initiate Full Scale Development of the selected submunition. The first AGM-109H Full Scale Development test vehicles will be delivered.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: FY 1984 funds will be used to initiate the flight test program for the Medium Range Air-to-Surface Missile. A combined Development Test and Evaluation and Initial Operational Test and Evaluation will be conducted. Inertial Sensor Assembly source selection will be conducted and guidance subsystem flight tests completed. Missile and engine qualification testing will also be conducted. Program costs are based on an Air Force Systems Command Will Cost estimate using other Tomahawk development, test and evaluation programs as a baseline.

(4) (U) Program to Completion: Complete Development Test and Evaluation and Initial Operational Test and Evaluation leading to approval for service use of the AGM-109H and production decision.

C. (U) Major Milestones:

Milestones		Date
A. Initiate Joint Full Scale Engineering Development		July 1980
B. Air Vehicle Critical Design Review		September 1982
C. Submunition Selection		January 1983
D. First Development of Test and Evaluation Flight		January 1984
E. Complete Development Test and Evaluation		December 1984
F. Production Approval	(December 1984)*	March 1985
G. Limited Operational Capability		September 1988

* Date presented in Fiscal Year 1983 Descriptive Summaries

(U) EXPLANATION OF MILESTONE CHANGES

F. Production Approval of the Medium Range Air-to-Surface Missile, AGM-109H, has slipped because of program delays caused by inadequate Navy funding.

Budget Activity: Tactical Programs, #4
Program Element: #64614F Medium Range Air-to-Surface Missile (MRASM)

Test and Evaluation Data

1. (U) Development Test and Evaluation: The Medium Range Air-to-Surface Missile (MRASM) test program is being managed by the Joint Cruise Missiles Project Office. The Air Force version of MRASM is the AGM-109H variant of the TOMAHAWK Missile. General Dynamics, San Diego, California, is the prime integrating contractor.

(U) MRASM development testing of the TOMAHAWK missile will incorporate test results from the Sea Launched Cruise Missile (SLCM), the AGM-109 Air Launched Cruise Missile (ALCM) and Ground Launched Cruise Missile (GLCM) programs to reduce MRASM test requirements. ALCM (AGM-109), GLCM, and SLCM are all variants of the basic TOMAHAWK design.

(U) A number of AGM-109 tests and demonstrations have been conducted to date which directly relate to the development of the Air Force version of the MRASM weapon system. These efforts include extensive Development Test and Evaluation efforts in conjunction with the SLCM program. The AGM-109 also participated in the competitive flyoff phase of the Air Launched Cruise Missile competition during which it was launched from a modified B-52G. The ALCM flight test program began in April 1979 with B-52 flutter and jettison tests. Actual AGM-109 flight testing was conducted from July 1979 through February 1980. This AGM-109 test program consisted of B-52 performance evaluations with captive carry testing, ten live flights, reliability and maintainability/demonstrations, mid-air recovery and survivability and vulnerability testing.

(U) Through October 1982 a total of 93 A/BGM-109 TOMAHAWK flight test missions had been accomplished of which 40 were launched from aircraft (both Air Force B-52G and Navy A-6). These missions provided generic cruise missile data applicable to MRASM development in the areas of engine performance, airframe stability and control, navigation/guidance and missile performance.

(U) A most significant test milestone was the May 1978 AGM-109 mission which demonstrated the feasibility of using the TOMAHAWK/Tactical Airfield Attack Munition dispenser combination to attack runway targets. This mission, launched from an A-6 aircraft and flown over realistic operational ranges, actually delivered dummy runway cratering submunitions. Ten of the twelve submunitions dispensed impacted on the runway target (Michael Army Airfield, Dugway Proving Ground, Utah).

(U) A September 1981 conventional land-attack Tomahawk flight, launched from an A-6, demonstrated the capability of the system to perform accurate Digital Scene Matching Area Correlator (DSMAC) updates at night. Specified target accuracy (CEP) requirements were met on all target passes.

Budget Activity: Tactical Programs, #4
Program Element: #64614F Medium Range Air-to-Surface Missile (MRASM)

(U) The Air Force version of the Medium Range Air-to-Surface Missile, the AGM-109H, is expected to fly for the first time during fiscal year 1984. A combined Development Test and Evaluation/Initial Operational Test and Evaluation (DT&E/IOT&E) will be conducted during the period from second quarter fiscal year 1984 through first quarter fiscal year 1985. Follow-on Test and Evaluation (FOT&E) will continue through mid fiscal year 1985. The Air Force Flight Test Center is the development test agency and the Air Force Test and Evaluation Center is the operational test agency. Most of the developmental flight testing will be conducted at the Utah Test and Training Range.

(U) Specific development test and evaluation objectives include verifying vehicle performance, stability and control and propulsion as well as terminal effectiveness of the runway cratering submunition. System effectiveness in accomplishing the mission will be evaluated to include launch, navigation, target acquisition, munitions dispensing and pattern effectiveness. Environmental testing, to include adverse weather tests in the climatic hanger at Eglin Air Force Base, Florida, will also be conducted.

2. (U) Operational Test and Evaluation (OT&E): The Air Force Test and Evaluation Center (AFTEC) will manage the operational testing of the Air Force's variant of the AGM-109 Tomahawk cruise missile, the AGM-109H. Personnel from Strategic Air Command (SAC), Tactical Air Command (TAC), Air Force Logistics Command (AFLC), and Air Training Command (ATC) will serve with AFTEC representatives on the OT&E test team. The Air Force combined DT&E/IOT&E and dedicated IOT&E testing are tentatively scheduled to begin in January 1984 and will continue through the first quarter of FY 85. Test missions will be staged from Edwards AFB, California, using the Utah Test and Training Range and the Tonopah Range. The AFTEC managed initial phase of Air Force FOT&E will be conducted following the production decision during FY 85.

Budget Activity: Tactical Programs, #4
Program Element: #64614F Medium Range Air-to-Surface Missile (MRASM)

3. (U) System Characteristics:

Physical Characteristics	General Dynamics AGM-109H
(U) Length (inches)	232
(U) Diameter (inches)	21
(U) Weight (pounds)	3,200
(U) Payload Weight (pounds)	1,200
(U) Useable fuel Weight (pounds)	331
(U) B-52 Internal Carriage (each)	4
(U) B-52 External Carriage (each)	8 or 12
(U) F-16 Carriage (each)	2

Performance Data

	Threshold	Goal	Demonstrated
Maximum Launch Range (NM)			To Be Determined
Maximum Launch Speed (M)			To Be Determined
Launch Altitude (feet)			
Minimum			To Be Determined
Maximum			To Be Determined
Terminal CEP (ft)			To Be Determined

* Interim maximum launch altitude c is acceptable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64770F 1/ — Title: Joint Surveillance and Target Attack Radar System (Joint STARS)

DOD Mission Area: #217 - Land Warfare Surveillance & Reconnaissance — Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	27,392	29,328	90,534	86,386	TBD	TBD
2814	Joint STARS Radar/Fire Control		25,628	77,534	76,386	TBD	TBD
2727	Joint STARS Interfaces		3,700	13,000	10,000	TBD	TBD

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: A critical need exists for an effective new capability to delay, disrupt, and destroy second echelon Warsaw Pact armored forces to hamper their use in breakthrough of Allied positions. Also, there is a critical need for a rapidly deployable, effective air-to-ground attack capability for use in less intense conflicts in contingency areas. To meet these needs, the Department of Defense initiated several joint Army/Air Force programs to improve our capability to interdict the enemy second echelon forces. JSTARS is one of these programs.

(U) JSTARS technology maturity was demonstrated as part of the Assault Breaker concept demonstration with the PAVE MOVER as the airborne radar sensor. The airborne PAVE MOVER Engagement System is the nerve center of the Assault Breaker concept. The PAVE MOVER Engagement System is a closed loop system for real time detection, tracking, and attack of second echelon forces. Utilizing Moving Target Indicator and Synthetic Aperture Radar techniques, the PAVE MOVER radar can detect and track second echelon enemy forces. Via its control interfaces, the PAVE MOVER Engagement System integrates accurate attack of those forces by providing guidance updates to standoff missiles and by cue-vectoring attack aircraft against the enemy targets.

(U) The PAVE MOVER Engagement System has now been merged with the Army Battlefield Data System, Program Element 64770A, into the OSD-directed Joint Surveillance and Target Attack Radar System (Joint STARS) joint program, with Air Force as the lead executive Service.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983	FY 1984	FY 1985	Additional To Completion	Total Estimated Cost
RDT&E	24,009	29,328	76,379		230,920	360,636

FY 1983 estimates were made before OSD-direction to create the Army/Air Force Joint Surveillance and Target Attack Radar System (Joint STARS).

1/ Previously known as PE 64616F, "PAVE MOVER Engagement System".

Program Element: #64770F

Title: Joint Surveillance and Target Attack Radar System (Joint STARS)

DOD Mission Area: #217 - Land Warfare Surveillance & Reconnaissance

Budget Activity: #4 - Tactical Programs

4. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Procurement, PE 27581F						
3010	0	0	0	0	TBD	TBD
3080	0	0	0	10,136	TBD	TBD

5. RELATED ACTIVITIES: There is no other system planned to provide fixed and moving target detection, surveillance, and tracking as well as closed-loop real time guidance/cue-vectoring of attack platforms against second echelon armor. Currently, this mission is performed The Joint STARS system will be the only DOD system able to direct attack aircraft or standoff missiles against moving ground targets from standoff ranges in real time.

(U) Program Element 63747F, PAVE MOVER, (now 63770F) has developed the advanced development model PAVE MOVER radars. Continuing efforts within the program element are directed toward advanced development of improved electronic counter countermeasure techniques and target discrimination techniques for transition into the Full Scale Engineering Development program conducted within Program Element 64770F.

(U) The Conventional Standoff Weapon (PE 64606F) has been merged with the Army Corps Support Weapon System (PE 64324A) into the Joint Tactical Missile System (JTACMS) program. This program, to enter Full Scale Development in FY 1983, will develop a modular missile system capable of delivering conventional warheads from standoff ranges using ground and air-borne platforms. Equipped, through a Pre-Planned Product Improvement program, with appropriate antiarmor submunitions, the Conventional Standoff Weapon will provide the standoff missile element of the Assault Breaker concept for application with the Joint STARS radar.

6. (U) WORK PERFORMED BY: The Air Force is lead Service for the Joint Surveillance and Target Attack Radar System (Joint STARS). The Joint STARS Joint Program Office is at Air Force Systems Command's Electronic Systems Division, Hanscom AFB, MA, where an integrated Army and Air Force program office will guide the Full Scale Development. A detachment of the Joint Program Office will operate from Ft Monmouth, NJ. The MITRE Corporation, Bedford, MA, assists the Joint Program Office in overall concept studies, test planning and evaluation of demonstrated results, preparation of technical specifications, and technical analyses. Independent test and evaluation will be under the direction of the Air Force Test and Evaluation Center and the Army Operational Test and Evaluation Agency.

(U) The advanced development model PAVE MOVER radars were developed under Program Element 63747F by Air Force Systems Command at the Rome Air Development Center, Griffiss AFB, NY. The contractors for the two advanced development model radars are Hughes Aircraft, El Segundo, CA, and Grumman Aircraft, Bethpage, NY, teamed with Norden Systems, Norwalk, CT. Contractors for the Full Scale Development for Joint STARS will be chosen through competitive source selection.

Program Element: #64770F

Title: Joint Surveillance and Target Attack Radar System (Joint STARS)

DOD Mission Area: #217 - Land Warfare Surveillance & Reconnaissance

Budget Activity: #4 - Tactical Programs

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable.

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: Joint STARS Radar/Fire Control, #2814

A. Project Description: This project provides Full Scale Development of the Joint Surveillance and Target Attack Radar System (Joint STARS) directed by OSD as a joint Army/Air Force program to meet an IOC for an airborne wide-area moving target indicating (MTI) surveillance capability, with preplanned product improvement to incorporate medium resolution fixed target imagery and real-time weapon guidance against ground movers at standoff ranges to and in the enemy second echelon. OSD has designated the OV-1 and TR-1 as primary platforms, with provision for 707-size platforms where needed for Rapid Deployment Joint Task Force (RDJTF) and contingency Command, Control and Communications (C^3) purposes. All Joint STARS platforms will use data links to transmit, in real time, target information to a set of ground stations located throughout the Army and Air Force command echelons from brigade through theater levels. The target engagement capabilities of the Joint STARS system are based on technology demonstrated by the PAVE MOVER part of the Assault Breaker technology demonstrations and include cue vectoring of low altitude aircraft and relative guidance of standoff air-to-surface and surface-tosurface missiles. This project will focus on developing the Joint STARS airborne radar, signal processors, controls and displays needed for a core capability of wide-area MTI surveillance, with planned growth to full end-to-end capability to detect, track, and control the attack of ground movers in real time.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: PAVE MOVER radars have been evaluated in the Assault Breaker End-to-End Technology Demonstration as part of a joint Army/Air Force/Defense Advanced Research Projects Agency effort at White Sands Missile Range, NM. The demonstration used PAVE MOVER airborne radars and ground processing stations to (1) guide standoff surface-to-surface missiles targeted against moving armored targets and (2) cue vector a low altitude penetrating F-4 aircraft. Concept definition studies and platform survivability studies were completed.

The advanced development model PAVE MOVER radars proved capable of detecting and tracking moving ground vehicles of the aircraft. The PAVE MOVER radars can also provide a small area spot fixed target image mode having a resolution for the detection/track of stopped vehicles.

To provide precision weapons guidance, the PAVE MOVER Engagement System uses its narrow beam radar capability to ensure accurate guidance commands to standoff missiles and attacking aircraft. This is accomplished by providing final attack guidance relative to target location by positioning both the attack platform and the target in the same radar narrow beam. Total system strike accuracy (including target location, weapon location, and guidance and control errors) using the PAVE MOVER relative guidance is designed for

(2) (U) FY 1983 Program: The Joint STARS advanced development airborne radars and ground processing stations

continue to be evaluated at White Sands. The radars have recently demonstrated true multi-mode capability, through which wide-area MTI surveillance and high-resolution Synthetic Aperture Radar imagery functions are interleaved in near-real time. Survivability studies are being expanded to examine total system survivability, including data links and ground stations. Studies are being done to examine the feasibility of installation of the Joint STARS radar into a variety of airborne platforms. The Joint Statement of Operational Requirements is being refined, and the system specification based on those requirements is being finalized. An acquisition strategy has been developed. The Full Scale Development Request for Proposals will be released, a competitive source selection held, and the contract will be awarded.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Funds are requested for the first full year of Full Scale Development. Preliminary design review for the airborne radar system will be conducted, and studies of integrated logistics support, training, basing, and total system performance will be done. Brassboard subsystems will be developed and tested, and production plans will be made. The Full Scale Development program will integrate the radar into appropriate airframes that provide cost-effective solutions to problems of (1) sufficient space for on board radar processing and weapons control/command and control interfaces; (2) long on-station loiter time; (3) rapid deployment capability; (4) capability to operate at reasonably high standoff altitude to minimize terrain radar shadowing; and (5) responsive support to the combat commanders who must fight the air/land battle.

(4) (U) Program to Completion: The Joint STARS program will complete Full Scale Development for the proper mix of airborne platforms and ground stations, in a time-phased manner to provide the earliest possible IOC for MTI/FTI Surveillance capability with preplanned enhancements to achieve weapons guidance capability. Critical Design Reviews, Development and Initial Operational Test and Evaluation, and Production Readiness Reviews will occur, and production of hardware will be completed. Follow-on Operational Test and Evaluation will be conducted on actual production equipment.

C. Major Milestones:

Milestones	Date
(1) (U) Release of Full Scale Development Request for Proposal	2Q FY 1983
(2) (U) Contract Award for Full Scale Development	4Q FY 1983
(3) Initial Operational Capability	--

9. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: Joint STARS Interfaces, #2727

A. (U) Project Description: Coupled with Project #2814, this project provides Full Scale Development of the Joint Surveillance and Target Attack Radar System (Joint STARS). This project focuses on the interfaces critical to system interoperability including the data links, protocols, message standards, and wave forms associated with command, control, and communication links. This project also develops the necessary processing software needed for interfacing of men and machines with the airborne radars and with the existing network of command and control systems, and with weapon delivery systems, existing or in development.

Program Element: #64770F

DOD Mission Area: #217 - Land Warfare Surveillance & Reconnaissance

Title: Joint Surveillance and Target Attack Radar System (Joint STARS)

Budget Activity: #4 - Tactical Programs

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Computer simulations of complex air/land battle scenarios were developed, using armor deployments and maneuvers representative of intense conflicts in a European scenario, for use in developing the concepts of operations that will best exploit the technological opportunity of the Joint STARS system. Interface studies were conducted in conjunction with the Army Corps Support Weapons System Special Task Force at Ft Sill, OK. Studies of possible alternative common data links were conducted. Detailed analyses were made of the targeting/attack planning/attack control functions. Strawman interoperability requirements were prepared and reviewed.

(2) (U) FY 1983 Program: In conjunction with project #2814, work continues toward award of the Full Scale Development contract. Emphasis on interfacing with command, control, and communication systems, and on cross-telling of information with other complementary sensor systems is through the refinement of the system performance specification, as it responds to the evolving Joint Statement of Operational Requirements. Simulation work continues, as does work to assess the impact of the changing threat on links and nodes within the Joint STARS system and among collateral systems.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: This project couples closely with project #2814 in the Full Scale Development work that will be underway. Project #2727 will focus on the interoperability aspects of the Joint STARS system, including the design and development of the necessary hardware/software/protocols needed to link the subsystems in a robust and easy-to-operate fashion. Design reviews, brassboard fabrication, simulations, and test and evaluation of various mechanisms for communication and inter-service operation will be emphasized.

(4) (U) Program to Completion: As the Full Scale Development progresses, the interoperability efforts will focus on increasingly more complex and demanding scenarios, and will evaluate the Joint STARS system in a variety of modes, with emphasis on interface integrity and recovery from hardware/software/system failures, from enemy countermeasures and from the inevitable "fog of war." This project will continually examine any deficiencies of the man-machine or machine-machine interfaces as they are exposed in design reviews, analyses, test and evaluation, and independent audits. This work is key to the evolutionary nature of the Joint STARS system, and will continue so long as the program develops.

C. (U) Major Milestones: Major milestones are identical to those in Project #2814.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64617F Title: Air Base Survivability
DOD Mission Area: Ground Based Anti-Air and Tactical Missile Defense Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	9,528*	6,753*	6,167	11,145	Continuing	Not Applicable
2621	Rapid Runway Repair	6,528*	6,753*	3,387	5,000	Continuing	Not Applicable
2895	Air Base Survivability	3,000*	0*	2,780	6,415	Continuing	Not Applicable

* Program Element 64617F was established in FY84 and existing projects in Program Element 64708F were transferred to the new Program Element.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Air Force needs the ability to sustain combat aircraft sortie generation capabilities under actual or threat of conventional air, chemical and/or open or covert ground attack against airbases. This new program element carries technology improvements initiated in Program Element 63307F, Air Base Survivability (ABS), into the Full Scale Development/Prototype phase prior to production.

(U) The program provides for an effective ABS system by applying a program management approach to the planning, integration and control of ABS technology. A comprehensive, world-wide ABS master plan and investment strategy will be developed to cover operational concepts, research, training, development, acquisition, manpower and support. Initial planning will emphasize improving near term capabilities.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

TOTAL FOR PROGRAM ELEMENT	6,300**	7,300***	5,100	—	Continuing	Not Applicable

** In FY 82, $3,258 was reprogrammed into Rapid Runway Repair to test mobile weapon system, mobile aircraft arresting system, explosive ordnance disposal, airbase damage assessment, and measures of merit modeling.

*** In FY 83, $547 reallocated out of Rapid Runway Repair into other projects within PE 64708F.
In FY 84, $1,300 was transferred from lower priority Air Force programs.

4. (U) OTH APPROPRIATION FUNDS: ($ in thousands) - Not applicable.

5. (U) RELATED ACTIVITIES: This program transfers the advanced development efforts in Program Element 63307F, Air Base Survivability, to Full Scale Engineering Development in this program element.

Program Element: #64617F	Title: Air Base Survivability
DOD Mission Area: Ground Based Anti-Air and Tactical Missile Defense	Budget Activity: #4 - Tactical Programs

6. (U) WORK PERFORMED BY: The in-house development organization responsible for elements of the program are the Armament Division at Eglin AFB, FL and the Air Force Engineering Services Center at Tyndall AFB, FL.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: (2621 - Rapid Runway Repair) - This project develops the capability to launch aircraft followin an airfield attack. In FY83, we will complete specifications for the combat hydraulic excavator and the dual drum vibr. ing roller including weapon testing of hardening kits for the equipment. Work continues on a quick setting polymer for spall damaged runways and minimum operating strip procedures. In FY84, development work will continue on airfield dama assessment system that will determine the portion of the runway to concentrate repair efforts. Previous accomplishment include: (a) capability to assess all airfield damage and select best operating strip within 80 minutes now, vice 210 minutes in 1978; (b) defined allowable roughness for F-4, C-141, A-10 and C-130 in 1982, vice none in 1978; (c) crushed stone with fiberglass cap crater repairs available in 1982, vice the need for costly and time consuming AM-2 matting in 1978; (d) silikal scab repairs in 1982, vice none in 1978; and (e) minimum operating strip selection method available now, vice none in 1978. Development work will continue to determine a cost effective quick patch for bomb damaged runways and develop an alternate launch and recovery system while runways are being repaired. We will also develop runway roughness criteria for additional combat aircraft.

B. (U) Project: (2895 - Air Base Survivability) - This project develops equipment to defend our airbases from attack. No work was directed in this project in FY83. In FY84, development work continues on the FLOTRAC system for landing gears that will allow our aircraft to taxi over bomb damaged taxiways and ramps, the AMF-80 shelters to provide personnel protection during an airfield attack, the mobile weapon system to provide point defense for our airbases and software and computer support to determine the most cost effective investment strategy for airbase survivability and the aircraft parachute arresting system to allow aircraft to land in a shorter distance on bomb damaged runways.

8. (U) PROJECT OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64703F
DOD Mission Area: #255 - Air Warfare Support

Title: Aeromedical/Chemical Defense Systems
Budget Activity: #04 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0.0	0.0	3,862	4,200	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Air Force has limited capability to treat and evacuate wartime casualties incurred in a chemical warfare or conventional warfare environment and no adequate means of improving this capability. This program will develop field deployment medical equipment systems for the treatment and evacuation of wartime casualties in a chemical or conventional warfare environment. This program will also provide tactical and strategic aeromedical evacuation systems and Air Force unique field medical treatment equipment (second echelon units), required to fulfill Department of Defense and Air Force needs.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: This program is a new start in FY 1984.

4. (U) OTHER APPROPRIATION FUNDS: Not applicable.

5. (U) RELATED ACTIVITIES: The Air Force Aeromedical/Chemical Warfare Defense Systems Development Program will be formally coordinated with other services (i.e., Triservice Aeromedical Research Panel). The Army is recognized as the Department of Defense lead agency for overall chemical warfare defense and casualty care. Only the efforts that are unique to the Air Force (Tactical and Strategic Aeromedical Evacuation, and the Air Force second echelon system) will be addressed in this program. Areas that have multiservice interest and are not unique to the Air Force will be identified to the Army for inclusion in their overall program. This program will also be coordinated on an international basis through the NATO/Military Agency for Standardization. Air Force operational commands will be involved throughout the development process.

6. (U) WORK PERFORMED: This program will be conducted by the Aeromedical/Casualty Systems Program Office, Systems Acquisition Directorate, Aerospace Medical Division, Brooks AFB, Texas. The program will be primarily contractual efforts.

Program Element: #64703F
DOD Mission Area: #225 - Air Warfare Support

Title: Aeromedical/Chemical Defense Systems
Budget Activity: #04 - Tactical Programs

7. (U) SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984:

(U) Project: 2866 Aeromedical/Chemical Defense Systems

A. (U) Project Description: New initiative to develop medical equipment and systems for the treatment and evacuation of wartime casualties in a chemical or conventional warfare environment. Project will also provide tactical and strategic aeromedical evacuation systems and field medical treatment equipment (second echelon units), needed to fulfill Department of Defense and Air Force operational requirements. Casualty rates will significantly increase with the introduction of chemical warfare into a conventional conflict and limit the effectiveness of the Air Force Medical Mission. Urgent requirements identified by the Major Commands for the treatment and evacuation of wartime casualties are the basis for the program. The ability to isolate the casualties from further chemical agent contamination, to allow medical personnel to render effective treatment under these conditions, and to adequately transport the casualties are key to the success of the Air Force Medical Mission. Specific development areas include: transportable and fixed shelters, chemical casualty decontamination system, life detection and vital signs monitoring equipment, chemical agent protected oxygen and blood storage equipment, chemical warfare agent protected aeromedical evacuation casualty care equipment and chemical agent identification and quantification systems.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Not applicable.

(2) (U) FY 1983 Program: Not applicable.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: (NEW START) The FY 1984 planned program will perform engineering development that will lead to production/field deployment of Aeromedical Chemical Defense Systems, that are unique to the Air Force medical mission or requirements. Once the systems have been successfully demonstrated in the advanced development program (PE 63745F Chemical Warfare Defense, Project 2722, Biomedical Chemical Warfare Defense), this program will insure that they are made ready for production (engineering, reliability, maintainability, etc.). Engineering development will begin in FY 1984 on a vital signs monitor and a chemical defense casualty ventilator being transitioned from advanced development. Where technology is available, solutions to field problems will be pursued directly versus employing exploratory and advanced development stages. Engineering development efforts will be initiated for: chemical warfare casualty decontamination system, decontamination kit for wound areas, second echelon fixed medical chemical warfare protective facility, chemical agent protected therapeutic oxygen systems that are logistically supportable, chemical agent protected intravenous systems, ambulatory casualty chemical protective system, and chemical protected aeromedical evacuation casualty equipment. The cost estimates used in developing the funds requested for this program are based upon similar chemical warfare defense advanced development and engineering development efforts. Only FYs 1984 and 1985 are significantly funded for this program due to a disconnect during the FY 1984 Program Objective Memorandum process. Efforts are underway to restore necessary FY 1985 through 1988 funding for this project.

Program Element: #64703F
DOD Mission Area: #225 - Air Warfare Support

Title: Aeromedical/Chemical Defense Systems
Budget Activity: #04 - Tactical Programs

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones:

Milestones	Dates
Program Initiation	FY 1984
Initial Operational Capability	FY 1988
Full Operational Capability	FY 1993

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64706F
DOD Mission Area: #225 - Air Warfare Support

Title: Life Support System
Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING: ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	13,049	11,417	15,399	16,514	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The objective of this program is to provide centralized management and development of life support equipment and subsystems necessary to assure maximum functional capability of aircrew throughout all mission environments and to enhance safe escape, descent, survival and recovery in emergency situations. Also provides for development, test and standardization of emergency equipment and protective clothing and devices for non-flying personnel. This is the only United States Air Force Program Element devoted to engineering development of life support equipment.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	10,959	12,417	20,130	Continuing	Not Applicable
Other Procurement	Life support equipment is procured under many weapon system and air base support Program Elements.				

Funds were added in FY 82 to develop and test a modification to the F/FB-111 crew escape module parachute system to prevent entanglement. The FY 84 reduction in funding has resulted from the revision of several task schedules.

4. (U) OTHER APPROPRIATION FUNDS: Life support equipment is procured under many weapon system and air base support Program Elements. Program Element 64706F funds are not used to satisfy production requirements. Funding for initial production of replacement items is normally provided by the Air Force Logistics Command System or Item Manager under various budget authorizations. Government Furnished Aeronautical Equipment acquisitions are funded by weapon system program elements. New items being introduced into the inventory for the first time are programmed by Air Force Systems Command and budgeted under Aircraft Program Elements; the thermal/nuclear flashblindness goggles for the Strategic Air Command are procured under several Air Base Support Program Elements; the Rocket Fuel Handler's Clothing Outfit is procured with funds from the Space Shuttle Program Element.

5. (U) RELATED ACTIVITIES: There are several Program Elements which provide exploratory development that contribute to full scale engineering development of life support equipment. Among these are Program Element 62201F, Aerospace Flight Dynamics; Program Element 62202F, Aerospace Biotechnology; Program Element 63205F; Flight Vehicle Technology; Program Element 64601F, Chemical/Biological Defense Equipment, Program Element 62723A, Clothing, Equipment and Shelter Technology; Program Element 63747A, Clothing and Equipment, Soldier Support/Survivability; Program Element 64204A, Air Mobility Support Equipment; Program Element 64713A, Combat Feeding, Clothing and Equipment; Program Element 62241N,

Ejection Seat Bio-Dynamics; Program Element 62758N, Biomedical Technology; Program Element 63216N, Mission Oriented Clothing and Devices; Program Element 64264N, Life Support Equipment. All tasks within this program are coordinated with the other Services. A formal Tri-Service Steering Committee was established in 1980 to achieve standardization and prevent duplication of efforts.

6. (U) WORK PERFORMED BY: The Aeronautical Systems Division, Air Force Systems Command, located at Wright-Patterson Air Force Base, Ohio, provides program management responsibility. Close interaction is maintained with other Air Force Systems Command Product Divisions, Test Centers and Laboratories. Support is also provided by other Service organizations, i.e.: the Army Natick Research and Development Command, Natick, Massachusetts; Naval Ordnance Station, Indian Head, Maryland; Naval Air Development Center, Warminster, Philadelphia. The ten major contractors in FY 1982 were: Air Research Manufacturing Company, Torrance, California; Douglas Aircraft Company, Long Beach, California; H. Koch & Sons, Anaheim, California; Irvin Industries Canada, Ltd, Ft Erie, Ontario, Canada; Cubic Corporation, San Diego, California; Bendix Corporation, Davenport, Iowa; Gentex, Carbondale, Pennsylvania; Talley Industries, Phoenix, Arizona; Frost Engineering, Englewood, Colorado; Motorola, Albuquerque, New Mexico and nine other contractors.

7. (U) LIFE SUPPORT SYSTEM (SINGLE PROJECT OVER $10 MILLION IN FY 84)

A. (U) Project Description: The Life Support System is composed of two major areas. The first includes the development or improvement of aircrew equipment such as flight clothing, oxygen equipment, helmets, anti-g pressure suits, nuclear flashblindness goggles, aircrew armor, ejection seats, restraint harnesses, automatic opening lab belts, parachutes, cartridge and propellant actuated devices, passenger egress systems, life preservers, rafts, anti-exposure suits, arctic clothing, survival kits, escape and evasion devices, survival radios and signaling devices. The other area includes the development or improvement of life support equipment for non-flying personnel and includes foot wear, eye protection, oxygen equipment, head protection, and hazard monitoring and protective devices. The system provides aircrews, passengers and non-flying personnel with equipment and protective clothing necessary to maximize both their functional contribution to assigned missions and to enhance the probability of their survival during emergency situations. The program provides for continual design, development, test, acquisition and operational support of personal equipment, mission related equipment and aircraft installed life support equipment.

B. Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Continued ongoing development tasks. Included were: Tri-Service Survival Avionics System for Search and Rescue Service; non-helmeted thermal flashblindness devices for the Tactical Air Command, Military Airlift Command and Strategic Air Command; joint United States Air Force/Canada Automatic Inflation Modulation Parachute; Joint United States Air Force/United States Navy Open Loop Oxygen Generating System for two-man fighter aircraft lightweight helmet for the Tactical Air Command; high performance anti-g systems (valves and suits) for high acceleration aircraft; Rocket Fuel Handler's Clothing Outfit for space shuttle personnel; active arm and leg restraint systems for high speed ejection; advanced aircrew armor for the Military Airlift Command; pararescue radios and other smaller life support efforts. Additional development tests included: Vacuum packed sleeping bags, safety toed arctic boots and a one-piece arctic fire retardant flying coverall for the Alaskan Air Command; escape and evasion viewing devices, and smoke masks for ground alert personnel for the Strategic Air Command; and single-point release system for the advanced concept ejection seat.

Program Element: #64706F
DOD Mission Area: Air Warfare Support, #225

Title: Life Support System
Budget Activity: Tactical Programs, #4

(2) (U) FY 1983 Program: Continue with the FY 1982 development tasks and complete the development of the alert personnel mask, anti-g valve and six other efforts. Added tasks will include: advanced escape system propulsion systems; wind blast protective devices for high speed ejection; high performance ballistically powered restraint system and advanced aerodynamic decelerators for open ejection seats; advanced digital sequencer and pitot/static sensor for the advanced concept ejection seat.

(3) (U) FY 1984 Planned Program: Funding is required in FY 84 to ensure program continuity of ongoing full-scale development tasks and integration of new tasks into the life support system. The following new tasks will be initiated: integrated aircrew ensemble for survival in all global environments; design and test subsystems and components for the next generation open ejection seat; design and test advanced aircraft canopy removal systems. Cost estimates are based on detailed implementation plans prepared by field agencies in support of validated operating command requirements.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Milestones: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64708F
DOD Mission Area: #225 - Air Warfare Support

Title: Other Operational Equipment
Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	15,275	16,353	10,651	6,937	Continuing	N/A
2054	Aerospace Facilities Engineering	1,309	1,000	800	800	Continuing	N/A
2479	Common Support Equipment	1,132	1,000	921	1,432	Continuing	N/A
2505	Aircraft Firefighting Equipment	600	300	300	700	Continuing	N/A
2536	Mobile Acft Arresting Equipment	1,583	400	0	0	0	3,769
2621	Rapid Runway Repair	6,528	6,753	Transfers to PE 64317F in FY 1984			
2674	Tactical Shelters	617	600	630	1,000	Continuing	N/A
2783	Ground Power Generator	0	6,500	8,000	3,005	2,595	20,100
2895	Air Base Survivability	3,106	0	Transfers to PE 64617F in FY 1984			
5973	Visual Coupled Systems	400	0	0	0	0	5,681

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program contains a group of projects which develop, test, and evaluate improved: Aircraft flightline common ground support equipment and mobile tactical shelters for multiweapon systems; fire fighting and rescue equipment/agents/procedures; alternate energy and environmental pollution abatement equipment/materials/procedures; airfield pavement equipment/materials/procedures. Special and peculiar needs of various theaters of operation, including those needs peculiar to the Rapid Deployment Forces, are addressed.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
RDT&E	12,155	16,553	18,257		Continuing	N/A

The difference in funding between the FY 1984 and the FY 1983 Congressional Descriptive Summary for FY 82 results from Project 2895 being added to PE 64708F; and for FY 84 results from Project 2621 transfering to PE 64617F in FY 84 and the Air Force reducing funding for PE 64708F by $5.0 million (including $2.1 million from Project 2621) in FY 84. This reduction resulted in delaying work planned for FY 84 in all projects of this program element.

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Other Procurement						
Funding Source: BP 1200						
Related to Project 2479, Common Support Equipment						
Universal Aircraft Towbars, Class I		3,329	4,683	5,002	5,281	18,295
Quantity		(300)	(469)	(470)	(468)	(1,705)

Program Element: #64708F
DOD Mission Area: #225 - Air Warfare Support

Title: Other Operational Equipment
Budget Activity: #4 - Tactical Programs

4. (U) OTHER APPROPRIATION FUNDS:

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Universal Aircraft Towbars, Class II		1,590	3,951	0	3,745	8,286
Quantity		(100)	(220)	0	(262)	(582)
X/Ku Band Radar Test Sets			1,500	1,600		3,100
Quantity			(16)	(16)		32

Projects 2536, 2621 and 2895 are covered in the FY 1984 Congressional Descriptive Summary for Program Element 64307F, Air Base Survivability and Recovery.

5. (U) RELATED ACTIVITIES: Program Element 63723F, Civil and Environmental Engineering Technology, provides advanced development for Projects 2054, 2505, and 2621. Program Element 27596F, Base Operations (Tactical Air Forces), provides for procurement of Mobile Aircraft Arresting Equipment and Rapid Runway Repair. Program Element 41896F also provides procurement for Rapid Runway Repair. BP 1200 funds, Common Support Equipment is the source for procurement of the Ground Power Generator (Project 2783) and Common Support Equipment (Project 2479). Close cooperation is maintained with sister services/or other federal government agencies via the Joint Logistics Commanders Panel on Support Equipment, the Joint Committee on Tactical Shelters and several groups, comprised of sister services and/or other federal government agencies address the civil engineering issues involved in Projects 2054, 2505, 2536 and 2621.

6. (U) WORK PERFORMED BY: There are numerous contractors. The top five contractors ($25,000 or more) are BDM Corporation, McLean, VA, Fairchild Republic, Farmingdale, NY, General Dynamics, Fort Worth, TX, McDonnell Aircraft, St. Louis MO (Project 2621, Rapid Runway Repair); and AAI Corporation, Baltimore, MD (Project 2479, Common Support Equipment). There are twenty additional contractors, the total dollar value of the additional contracts is $20 million in FY 82 and FY 83. The in-house developing organization for Projects 2054, 2505, and 2621 is the Air Force Engineering and Service Center, Panama City, FL; for Projects 2479, 2536, and 2783 is the Air Force Systems Command's Aeronautical Systems Division, Dayton, OH; for Project 2674 Air Force Systems Command's Electronic Systems Division, Bedford, MA; for Project 2895, Air Force Systems Command's Armament Division, Fort Walton Beach, FL.

7. (U) PROJECTS, LESS THAN $10 MILLION IN FY 84):

A. (U) Project 2054, Aerospace Facilities Engineering, is to develop methods and products to satisfy stated Air Force requirements for facilities essential for tactical and strategic operations. Completed blast test of aircraft shelter door wheel assembly. Data for air quality assessment has been loaded into an automatic data processing system. Completed task on energy conservation in hangars, on application of wind turbine and on energy optimization model. The following tasks are scheduled for completion in FY 83: North Atlantic Treaty Organization (NATO) Reinforced Wall Test, Durable Airfield Markings, Refuse Derived Fuel Integration, Cofiring of Refuse Derived Fuel and Coal and Logistics Power Autonomy. The following tasks are scheduled for completion in FY 84: United States Air Force Academy Boiler Emissions, Photo Waste Treatment, and Fuel Resistant Porous Surface.

Program Element: #64708F
DOD Mission Area: #225 - Air Warfare Support

Title: Other Operational Equipment
Budget Activity: #4 - Tactical Programs

B. (U) Project 2479, Common Support Equipment develops support equipment that is more effective; has lower life cycle cost; and has a greater return on investment than support equipment being used to perform the same/similar function. Completed Operational Test and Evaluation of the X/KU Band Radar Test Set. Completed Critical design review of Universal Aircraft Towbars. Terminated development of Positive Displacement Air Cycle Machine (air conditioner). Completion of test on a Magnetic Compass Calibration Set (developed by the Navy) is scheduled for FY 83. Initial Operating Capability for the X/Ku Band Radar Test Set is scheduled for FY 83. Completion of development of Universal Aircraft Towbars is scheduled for FY 83, First Hardware delivery is scheduled for FY 84.

C. (U) Project 2505, Aircraft Fire Fighting Equipment, develops improved fire fighting, suppression and rescue equipment, materials and methods to protect Air Force unique weapons systems and facilities. Accomplishments in FY 82 and FY 83 to date follow. Published P-13 Dual Agent Application. Designed an optimum aircraft rescue tool. Completed testing of oscillating turret systems. Published data on use of three (vice six) percent aqueous film forming foam. Completed evaluation of fire fighting training smoke abatement. Completed prototype of infrared guided water turret system. Complete fabrication of a prototype optimum aircraft rescue tool in FY 83 and perform test and evaluation in FY 84. Complete fabrication of fire fighting vehicle simulator in FY 84 and initiate testing in FY 84. Complete operational, test and evaluation of an improved fire fighter's breathing apparatus in FY 83.

D. (U) Project 2536 is covered in the FY 1984 Congressional Descriptive Summary for PE 64617F, Air Base Survivability and Recovery.

E. (U) Project 2621 is covered in the FY 1984 Congressional Descriptive Summary for PE 64617F, Air Base Survivability and Recovery.

F. (U) Project 2674, Tactical Shelters, provides for development, technical support and acquisition support of tactical shelter systems to support Air Force tactical and strategic operations. The goal is to assure the Air Force has available cost effective tactical and strategic shelter systems consistent with Air Force operational requirements. Accomplishments in FY 82 and FY 83 to date include: Successfully completed developmental test and evaluation of fiber reinforced plastic tactical shelter, completed developmental test and evaluation of electromagnetic pulse effects on tactical shelters, completed ballistic evaluation and initiated fabrication of nuclear weapons container. Initiate computer model and validation testing of S-280C, tactical shelter. Continue to test composite materials for fabrications of tactical shelters. Continue developmental test and evalation electromagnetic interference aspects of shielding and gasketing techniques and continue to support the development of superjack, a set of jacks and towbars allows a shelter to be loaded onto an aircraft or a flatbed truck by either level loading or roll-on/roll-off.

G. (U) Project 2783, Ground Power Generator, designs, develops, tests and evaluates flightline generator set and air conditioner that is much more fuel efficient and easier to maintain than the current equipment, thereby significantly reducing life cycle cost. To date a request for proposal has been released to over one hundred potential offers. Contract awards for two competitive designs are scheduled for FY 83. Fabrication of three each prototypes of two ground power generator designs will be initiated in FY 83 and currently is scheduled for completion in late FY 84.

H. (U) Air Base Survivability is covered in the FY 1984 Congressional Descriptive Summary for PE 64617F, Air Base Survivability and Recovery.

Program Element: #64708F

DOD Mission Area: #225 - Air Warfare Support

Title: Other Operational Equipment

Budget Activity: #4 - Tactical Programs

I. (U) Project 5973, Visually Coupled Systems develops avionics systems that aid pilots in carrying out their flying duties. This project is scheduled for completion in mid - FY 1983.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 64710F
DOD Mission Area: #327 - TIARA for Tactical Air Warfare

Title: Reconnaissance Equipment
Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	8,432	7,695	13,382	16,329	Continuing	N/A
1155	Electro-Optical Collection/ Reconnaissance (COMPASS SEVEN)	2,450	3,895	6,000	6,029	Continuing	N/A
1156	Radiation Intelligence (RINT)	722	0*				
2096	Interim Tactical ELINT Processor (ITEP)	1,500	100	100	0	0	9,600
2337	Advanced Reconnaissance Sensor (ADRES)	2,200	2,000	5,500	8,000	32,500	50,200
2704	Tactical Electronic Reconnaissance Sensor (TEREC)	1,560	1,700	1,782	1,000	8,500	30,402
2660	AAO-X Infrared Sensor	0	0	0	1,300	48,000	49,300

* Project transferred to Tactical Cryptologic Program (TCP) in FY 1983.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Projects in this program element support Air Force and other agency's reconnaissance/intelligence collection requirements by providing engineering development of airborne and ground sensors and associated equipment used to collect, record, and process imagery and electronic warfare data. Some systems developed under this program element become engineering prototypes for follow-on production of operational systems. Certain projects develop unique intelligence gathering sensor systems for special one-of-a-kind tasks.

Program Element: #64710F
DOD Mission Area: #327 - TIARA for Tactical Air Warfare

Title: Reconnaissance Equipment
Budget Activity: #4 - Tactical Programs

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

TOTAL FOR PROGRAM ELEMENT	11,357	7,695	23,781	N/A	Continuing	N/A

FY 1982 reduction is due to a classified program in Electro-Optical Collection/Reconnaissance (COMPASS SEVEN) being restructured. FY 1984 cut resulted when one program, Electronic Warfare Support Mission (Project 2501), was transferred to the Tactical Cryptologic Programs and another project, AAQ-X Infrared Sensor, was slipped one year to a FY 1985 start.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Other Procurement 3080 (PE 27213F)	6,114	0	11,018	11,962	11,231	45,090

5. (U) RELATED ACTIVITIES: PE 63743F, Electro-Optical Warfare, and PE 637208F, Reconnaissance Sensors/Processing Technology, provide advanced development technology inputs to this program element. Procurement funds for new sensors and/or aircraft modifications resulting from this program, such as the Tactical Electronic Reconnaissance (TEREC) System, are provided by PE 27213F, RF-4C Squadrons. Procurement funds for ground exploitation facilities, such as TEREC processing are generally provided by PE 27431F, Tactical Air Intelligence Systems Activities and PE 27213F, RF-4C Squadrons. Air Force Logistics Command provides support for RC-135 modifications for program element projects. Planned starts in tactical sensor development will address requirements for sensor capabilities as identified by the Advanced Tactical Air Reconnaissance System (ATARS) program, PE 63239F. All projects in this program element are coordinated as appropriate with the Major Commands and/or the National Security Agency groups directly involved in the various programs.

6. (U) WORK PERFORMED BY: Texas Instruments, Dallas, TX (TEREC Remote Terminals (TRTs) and TEREC data processing in the Tactical Information Processing and Interpretation (TIPI) facility, Project 2704); AMECOM/Division of Litton Industries, College Park, MD (TEREC airborne sensors, project 2704); Vought Systems Division, Grand Prairie, TX (electro-optical systems, project 1155); and Rockwell International Corporation, Anaheim, CA (Infrared data base generation, project 2337). Responsible agencies of the Air Force Systems Command include the Aeronautical Systems Division, Wright-Patterson AFB, OH, and the Electronic Systems Division, Hanscom AFB, MA.

Program Element: #64710F | Title: Reconnaissance Equipment
DOD Mission Area: #327 - TIARA for Tactical Air Warfare | Budget Activity #4 - Tactical Programs

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 1155-Electro-Optical Collection/Reconnaissance (COMPASS SEVEN) - COMPASS SEVEN is a continuing program to develop one-of-a-kind sensors to meet the specialized requirements of the intelligence community and the strategic and tactical air forces. Electro-Optical (E-O) collection capabilities are required to access the capabilities of foreign E-O systems and collect other high value specialized information. The information obtained is essential for the evaluation of Soviet intensions. and the development of countermeasures, warning devices, and US weapons systems.

A new effort to develop a miniature electro-optical camera for special ground surveillance and collection purposes will be initiated. In 1984 the will continue development, several units will be fabricated for testing and possible initial deployment. The high resolution camera update and the miniature electro-optical camera development will continue.

Research into on- and off-axis laser detection will continue.

B. (U) Project: 2096-Interim Tactical ELINT Processor (ITEP) - ITEP is a multisource Electronic Intelligence (ELINT) processor/correlator used to assess data from various national, strategic, and theater assets. The entire ITEP project is not in this program element, however, this program element is funding the integration of the TEREC data-link receive capability into the ITEP. FY 82, 83, and 84 efforts are to put TEREC data-link capability into the ITEP. This effort includes the data-link hardware itself and the necessary software interfaces to enable the ITEP computer to process the TEREC information.

C. (U) Project: 2337-Advanced Reconnaissance Sensor (ADRES) - ADRES will update the RF-4C sensor package and support the Advanced Tactical Air Reconnaissance System (ATARS) program. The Tactical Air Forces (TAF) have a requirement for near-real-time high quality reconnaissance information during adverse weather/night conditions. ADRES will develop a sensor suite to fill this requirement through electro-optical sensors, onboard storage and reviewing, data-link to selected ground facilities, and a fast and accurate ground interpretation/dissemination facility. The primary area of work in FY 82 and 83 is to build a digital infrared data base to be used in the development of automatic target recognizer designator equipment. These recognizer/designators will be used onboard the reconnaissance aircraft to detect and classify targets and edit the sensor tape for data-link transmission. The data base and recognizer technology will also be used by the Air Force's and the Army's night attack systems. System definition studies to define the ADRES sensor suite specifications will begin in FY 1983. In FY 1984 the digital data base effort will conclude and the primary emphasis will shift to full scale engineering development of the sensor suite and associated equipment.

Program Element: #64710F | Title: Reconnaissance Equipment
DOD Mission Area: #327 - TIARA for Tactical Air Warfare | Budget Activity: #4 - Tactical Programs

D. Project: 2704 Tactical Electronic Reconnaissance (TEREC) - This project has developed and produced an Electronic Warfare Support Measures (ESM) sensor which can detect, locate, identify, and report enemy radar emitters in near-real-time and gather parametric data on emitters for later evaluation. This information can be used by tactical commanders and aircrews for battlefield assessment, threat avoidance, cueing of other sensors and attack systems, or direct target attack. Three main sub-projects are funded within this project. The first is the TEREC airborne sensor itself employed on RF-4C reconnaissance aircraft. The second is the incorporation of TEREC data-link receive and TEREC tape processing capability into the Imagery Interpretation (II) segments of the Tactical Information Processing and Interpretation (TIPI) system. The third project is to develop and procure a TEREC Remote Terminal (TRT) for individual tactical unit use. The TRT will provide individual units with the identity and location of enemy radars in near-real-time. In FY 1982 the last of the original 18 TEREC modified RF-4C's were delivered. Six more units will be delivered and installed starting in FY 84. Work progressed on incorporating TEREC data-link and tape processing into the TIPI. Some TEREC modified II units are fielded at this time. TEREC presently has an encrypted UHF data-link capability; work to encrypt the HF data-link was started in FY 82. Procurement of TRTs started in FY 82, the first production TRT is scheduled for delivery in Mar 83. In FY 83 work will continue on HF data-link encryption and the TIPI modification. TEREC sensor updates, to increase TEREC's capabilities against new and exotic radars, will be initiated throughout the life of the sensor. In FY 83 an update to increase capability against emitters and increase processing will continue. The first eighteen TRTs will be delivered. Additional TRTs, to fulfill the Tactical Air Forces' (TAF) stated requirements, are to be procured starting in FY 84. FY 83 research and development efforts will incorporate changes, such as one encrypter for HF and UHF, into this second buy of TRTs. In FY 84 software and hardware updates will continue. Encryption efforts will center around trying to use one device for both HF and UHF in the TEREC sensor and the ground processors.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64715F
DoD Mission Area: #225 - Air Warfare Support

Title: DoD Physical Security Equipment-Exterior (Eng Dev)
Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	7,370	18,595	17,955	15,363	30,900	159,400

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports the development of the Department of Defense Base and Installation Security System, a standardized set of components, interfaces, and methodology for creation of exterior physical security systems, by accomplishing full-scale development tasks in three functional areas: detection, command and control, and imaging. A Department of Defense need exists for a family of standardized modular equipment, integrable into system configurations to provide a level of security in consonance with the deployment mode, threat level, and sensitivity of the asset being protected. The resulting security equipment increases the capability of the security forces to detect and intercept terrorists and permits increased mobility of the forces for better utilization of existing manpower.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	7,870	18,595	12,120		24,800	130,300
Procurement (Other)(27589F) (formerly 27596F)	10,789	21,820	70,953		Continuing	Not Applicable

The increase in FY 1984 and Total Estimated Costs for RDT&E funds is due to the addition of two new full-scale development items: the waterborne intrusion detection system and the transportable sensor/display system. The decrease in FY 1984 procurement funding is due to a slip in the full-scale development of the mobile individual resource protection sensor which slipped procurement funding requirements to FY 1985.

4. (U) OTHER APPROPRIATION FUNDS:

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Procurement (Other)(27589F) (formerly 27596F)	10,860	20,424	8,806	83,498	Continuing	Not Applicable

Program Element: #64715F
DoD Mission Area: #225 - Air Warfare Support

Title: DoD Physical Security Equipment-Exterior (Eng Dev)
Budget Activity: #4 - Tactical Programs

5. (U) RELATED ACTIVITIES: Advanced development tasks including equipment prototypes, development of technology base, and development testing are accomplished under Program Element 63714F, Department of Defense Physical Security Equipment-Exterior (Advanced Development). Procurement of physical security equipment is accomplished using Other Procurement-Air Force funding under Program Element 27589F, Base Physical Security Systems. The Base and Installation Security System equipment will be designed for interoperability with the Army interior security system (Facility Intrusion Detection System) and the Army tactical sensor system (Remotely Monitored Battlefield Sensor System). Management oversight of the physical security equipment programs is provided by the Department of Defense Physical Security Equipment Action Group with the Chairperson residing in the Office of the Under Secretary of Defense for Research and Engineering.

6. (U) WORK PERFORMED BY: This program is managed by the Physical Security Systems Directorate, Electronic Systems Division Hanscom Air Force Base, MA. Department of Defense agencies performing development tasks are: Rome Air Development Center, Griffiss Air Force Base, NY; Army Mobility Equipment Research and Development Command and Army Night Vision Laboratory, Fort Belvoir, VA; Army Waterways Experimental Station, Vicksburg, MS; Naval Ocean Systems Center, San Diego, CA; and the Naval Coastal Systems Center, Panama City, FL. In addition to these Defense agencies, the Department of Energy/Sandia Laboratories, Albuquerque, NM performs engineering development tasks and the Analytical Systems Engineering Corporation assists in the system engineering support and integration task.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. (U) DoD Physical Security Equipment-Exterior (Eng Dev) (SINGLE PROJECT OVER $10 MILLION IN FY 1984)

A. (U) Project Description: This program responds to Secretary of Defense direction contained in Department of Defense Directive 3224.3, 1 Dec 1976, which designates the Air Force as executive agency for the development of standardized exterior physical security equipment and systems for the protection of bases and installations. This program will provide pre-production equipment and subsystems, and through test and evaluation, production specifications for the Base and Installation Security System equipment for the four Services. The engineering development tasks consist of optimization of the overall system configuration through conduct of component, subsystem, and system testing, and preparation of production specifications. The Total Base and Installation Security System objectives are to provide a capability for high level security, against all threat levels, for resources in the three deployment modes: permanent, semipermanent, and mobile. Facilities and developments of other Services, government agencies, and commercial industries will be used to the maximum to insure that duplication of effort is avoided.

Program Element #64715F
DoD Mission Area: #225 - Air Warfare Support

Title: DoD Physical Security Equipment-Exterior (Eng Dev)
Budget Activity: #4 - Tactical Programs

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Many items undergoing development for the Base and Installation Security System have completed full-scale development. The permanent individual resource protection sensor completed development in FY 1982.

(2) (U) FY 1983 Program: The program provides for continued full-scale development of the following items: electromagnetic point sensor, mobile individual resource protection sensor, video frame storage element, magnetic/seismic line sensor signal processor, and ported coaxial cable line sensor.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Includes funds to complete engineering development of those system components intended for the Total Base and Installation Security System and to continue engineering development of other items which were initiated in prior years. The magnetic/seismic line sensor signal processor is expected to complete full-scale development in FY 1984 and will upgrade the physical security at nuclear storage areas while extending the useful life of the buried line sensor. Full-scale development of the waterborne intrusion detection system and the transportable sensor/display system will begin in FY 1984. The waterborne intrusion detection system will provide a capability to detect surface and underwater intrusion attempts at high-value loading docks, Trident bases, and other sensitive waterfront facilities. The transportable sensor/display system will provide a complete detection system for transportable weapon systems such as Ground Launched Cruise Missile flights when deployed in the field. Cost estimates are based on inputs from various government agencies performing these development efforts which were updated in September 1982.

(4) (U) Program to Completion: This program will provide type C (production) specifications for fully competitive production of a family of modular electronic equipment, capable of being integrated in various system configurations to meet Department of Defense and Service requirements for physical security. As requirements for exterior physical security are validated, development tasks will be assigned to the Air Force by the Under Secretary of Defense for Research and Engineering to satisfy the requirement.

C. (U) Major Milestones: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64724F — Title: Tactical C^3 Countermeasures
DOD Mission Area: 372 - Escort, Stand-off, and Counter C^3 — Budget Activity: 4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	13,025	25,276	28,522	32,768	Continuing	N/A
2462	COMPASS CALL Development	8,170	4,600	10,100	10,900	Continuing	N/A
2677	C^3 Countermeasures Development		1,100	3,209	8,200	Continuing	N/A
2726	Electronic Combat Support	3,665	5,276	9,657	10,488	Continuing	N/A
2917	CASCADE	1,200				0	1,200
2927	PAVE TIGER		14,300*	5,556	3,164	Continuing	N/A

*Includes $6,300K directed in the 21 December 1982 Continuing Resolution Authorization for FY 83 for PAVE TIGER. This direction was included in the restructuring of the Conventional Standoff Weapon program.

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: To accomplish close air support, interdiction, and counter air missions, the Tactical Air Forces (TAF) require a command, control, and communications (C^3) countermeasures capability. The TAF EC-130H stand-off jamming aircraft. We must improve the TAF's capability to support and protect friendly forces. A key instrument to improve the TAF's capability is the ability to disrupt enemy while protecting our own C^3 from enemy disruption. With this capability, the TAF can isolate selected enemy units from their command and control to prevent enemy units from receiving target assignments and enemy aircraft from receiving controls vectors. This program provides for the engineering development of new C^3 countermeasures equipment for tactical electronic combat applications.

3. (U) COMPARISON WITH 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
RDT&E	10,455	18,976	27,957		Continuing	N/A

FY 82 Differences: Reprogramming between this and other Program Elements to support CASCADE and PAVE TIGER (PE 64746F).

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FY 84 Differences: Funding adjustments during Air Force budget development process.

4. OTHER APPROPRIATION FUNDS: ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
2462	COMPASS CALL DEVELOPMENT						
	Aircraft Procurement-PE 27253F Funds*	9,461	16,028	8,110	13,828	Continuing	N/A
	*Includes Modifications and initial spares.						
	Operations and Maintenance-PE 72207F Funds	0	210	304	1,364	Continuing	N/A
2726	Electronic Combat Support Other Procurement-PE 28021F Funds	0	0	0	11,795	Continuing	N/A
2927	PAVE TIGER Missile Procurement-PE27246F Funds	0	24,200	48,797	38,887	4,781	116,665
	Quantities						
	Military Construction-PE 27246	0	0	3,000	7,500	0	10,500

5. (U) RELATED ACTIVITIES: The Air Force production manager (Air Force Logistics Command) and development manager (Air Force Systems Command) for the EC-130H (Project 2462) operate with a joint agreement for interface and configuration control to ensure that new equipment can be incorporated into operational use. Air Force Systems Command is responsible for development and production of the mini-drones and ground-based systems in the other four projects. This program will build upon technology demonstrated in PE 63718F, Electronic Warfare Technology and PE 63749F, C^3 Countermeasures Advanced Systems. Technology that satisfies similar requirements for other systems may be drawn upon, such as those in PE 62204F, Aerospace Avionics, PE 62715A, Expendable Jammers, and PE 63214N, Tactical C^3 Countermeasures. This program provides engineering development for PE 27253F (COMPASS CALL), PE 28021F (Electronic Combat Support), and PE 27246F (Expendable Drones).

6. (U) WORK PERFORMED BY: Aeronautical Systems Division, Wright-Patterson AFB, OH - management of program to develop improvements to the EC-130H and to develop and acquire mini-drone systems; Electronic Systems Division, Hanscom AFB, MA - management of program to develop and acquire ground-based systems; Air Force Logistics Command, Wright-Patterson AFB, OH - management of the EC-130H modification program. The primary contractors performing work for this effort include:

Program Element: 64724F Title: Tactical C^3 Countermeasures
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Lockheed Aircraft Services, Ontario, CA (Project 2462), Sanders Associates, Nashua, NH (Project 2462), Magnavox, Fort Wayne, IN (Project 2462), and Boeing Military Airplane Company, Wichita, KS (Project 2927).

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project 2677 - C^3 Countermeasures Development: In 1979 the Air Force identified a requirement for a C^3 countermeasures capability to support air operations penetrating enemy territory beyond the effective jamming range of the EC-130H stand-off aircraft. While numerous possiblities (e.g.: the EF-111, on-board jamming systems, and mini-drones were explored to satisfy this requirement, a pragmatic approach was taken to field a system in the near-term using low-risk technology. The mini-drone was identified as a particularly promising and cost-effective candidate. The mini-drone system, nicknamed PAVE CRICKET, will disrupt such targets as

This project will also evaluate the requirement for and fund the development and acquisition of a C^3 countermeasures self-protection capability for penetrating aircraft.

(U) The PAVE CRICKET development will begin in FY 1983 with a feasibility demonstration of off-the-shelf equipment. In FY 1984, multiple contracts will be awarded for a competitive "fly off" and quality assurance tests of the jammer system. PAVE CRICKET will use the same vehicle as the PAVE TIGER mini-drone system developed in Project 2927.

B. Project 2726 - Electronic Combat Support: The Air Force C^3 countermeasures program includes requirements for both offensive actions against the enemy's C^3 links and nets and defensive actions to protect friendly C^3 systems. Projects 2462, 2677, and 2927 in this program element (PE 64724F) provide offensive capabilities near and beyond the foward line of troops. This project funds ground-based systems to provide both offensive and defensive capabilities on the friendly side of the line of conflict. Specific developments in this project include counters to counters to friendly C^3 nets to provide a realistic testing and training environment; systems to analyze the vulnerabilities of friendly emitters to Soviet exploitation; development of an operational C^3 countermeasures support data base to support all C^3 countermeasures programs; and development of

During FY 1982 the Air Force completed the definition phase for a ground-based system to counter During FY 1983 the Air Force will conduct a competitive source selection and award a contract for the engineering development of this system. This ground-based system will also have the capabilities to counter friendly C^3 nets to provide a realistic testing and training environment. The definition of an analysis system for evaluation of friendly emitter vulnerabilities to Soviet exploitation will continue. Engineering development of the C^3 countermeasures operational support data base will also continue.

(U) During FY 1984 all previously started engineering development tasks will continue. Engineering development of the analysis system for evaluation of friendly emitter vulnerabilities will begin.

C. Project 2927 - PAVE TIGER: In 1981 the Air Force identified an urgent requirement for a capability to

Program Element: 64724F
DOD Mission Area: 372 - Escort, Stand-off, and Counter C^3

Title: Tactical C^3 Countermeasures
Budget Activity: 4 - Tactical Programs

We have thus far given the enemy a [

] Following a review of currently available technology, the mini-drone was determined to be the only viable approach in the near term. Due to the urgency of obtaining this capability, the Air Force is using quick reaction capability (QRC) procedures for this development to achieve an IOC in [ ] Following development of this system, the Air Force will review improvements or alternatives to the mini-drone for mid and far term approaches to [

]

(U) This project was begun in FY 1982 in PE 64746F, Expendable Drones. During that year the engineering development was started, a seeker source selection was conducted and a seeker vendor selected, and both the system design review and the preliminary design review were conducted.

(U) During FY 1983 engineering development of the PAVE TIGER system, to include the vehicle, its payload, and the ground launch, test, and support equipment, will continue. Flight test is scheduled for the summer of 1983. Long lead procurement and production line start up will begin.

Engineering development will be completed in FY 1984. Following the flight test a production decision will be made to acquire [ ] vehicles and associated equipment.

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project 2462 - COMPASS CALL Development:

A. Project Description: In FY 1979, the Air Force defined an EC-130H stand-off jamming platform to be integrated into a Defense-wide command, control, and communications (C^3) jamming capability. The airborne capability will complement both present and future ground and sea-based systems to provide the theater commander with a coordinated jamming capability. The EC-130H stand-off jamming platform initially used readily available equipment to provide a near-term baseline capability. Meanwhile, the portions of the C^3 countermeasures package that needed development proceeded in this project. This project provides engineering development of jammers to counter or disrupt [

] within the enemy C^3 network. This project makes major improvements to the initial EC-130H installed equipment to make it more powerful, faster, smarter, and able to handle more threats at one time. These improvements are necessary to correct known deficiencies in the baseline aircraft and to keep the EC-130H current throughout the 1980's. All improvements to the aircraft will also be made to the mission simulator to provide realistic mission-aircrew training.

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishment: Development of the [ ] jammer was completed and testing was started. Engineering development of the signal location system was started. The definition phase of another program to counter a new threat was begun. All system design work was completed on the mission simulator.

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(2) FY 1983 Program: Testing of the jammer will be completed followed by a production decision for incorporation into the baseline EC-130H. Integration and checkout of the mission simulator, updated with the jammer, will be completed followed by delivery to the field. Development efforts to incorporate other improvements made to the aircraft into the mission simulator will continue. All other engineering development and definition efforts started in FY 1982 will continue.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Engineering development and testing of the signal location system will be completed followed by a production decision for incorporation into the baseline EC-130H. The engineering development begun in FY 1982 to counter a new threat will continue. The definition phase of a jammer to counter an additional communications system will begin. Updates to the mission simulator to incorporate improvements made to the baseline aircraft will continue. Cost estimates are based on a combination of ongoing contract prices and Air Force estimates from previous similar work.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64725F
DOD Mission Area: #344 - Tactical Command and Control

Title: Combat Identification Systems
Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ In Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	12,184	19,000	26,952	32,401	Continuing	Not Applicable
2463	Mark XII Identification Friend or Foe (IFF) Program	929		1,900		To Be Determined	To Be Determined
2597	Noncooperative Identification Subsystems	3,900	4,848	13,768	11,983	Continuing	Not Applicable
2598	Cooperative Identification Systems	400			18,218	Continuing	Not Applicable
2751	Indirect Identification Subsystems		1,700	1,800	2,200	Continuing	Not Applicable
2778	TAC Air Identification	6,955	12,452	9,484		To Be Determined	To Be Determined

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The purpose of this program element is to accomplish engineering development of systems that will provide reliable long-range identification of airborne targets in both all-weather and hostile electromagnetic countermeasures environments. This program is necessary because the numerical superiority of the projected threat demands that we be capable of engaging the enemy at long ranges with our beyond visual range weapons. The long range identification which is a prerequisite for such engagements

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
RDT&E	12,155	20,552	28,125		Continuing	Not Applicable

The $29 thousand dollar increase in FY 1982 reflects reprogramming to support additional testing of modifications developed under Project 2463. The $1.552 million dollar reduction in FY 1983 reflects the results of the House and Senate Authorization Conference. FY 1984 differences reflect revised inflation indices.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

5. (U) RELATED ACTIVITIES: Work accomplished under this program element is part of an integrated Tri-Service effort to improve United States identification capabilities worldwide. Related activities include: Program Element (PE) 63267N,

Program Element: #64725F Title: Combat Identification Systems
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NATO Future Identification System; PE 63515N, Advanced Identification Techniques; PE 63706A, IFF Developments; PE 63742F, Combat Identification Technology; PE 64211N, AIMS/ATCRBS/Mark XII; and PE 64709A, IFF Equipment. Coordination and integration of the various activities under these program elements are accomplished through the Tri-service, Air Force lead Combat Identification System Program.

6. (U) WORK PERFORMED BY: The overall program is managed by the Tri-Service, Combat Identification System Program Office at the Aeronautical Systems Division, Air Force Systems Command, Wright Patterson Air Force Base, OH. The program office receives support from the Air Force Wright Aeronautical Laboratories/Avionics Labortory, Wright Patterson Air Force Base, OH and other offices within the Aeronautical Systems Division. Support is also provided by the Electronic Systems Division, Air Force Systems Command, Hanscom Air Force Base, MA; the MITRE Corporation, Bedford, MA and the Electromagnetic Compatibility Analysis Center, Annapolis, MD. Additionally, the following contractors are engaged in work under this program: Hazeltine Corporation, Greenlawn, NY (project 2463); Teledyne Electronics, Newburg Park, CA (project 2463); General Dynamics, Fort Worth, TX (projects 2597 and 2751); Westinghouse Electric Corp., Baltimore, MD (project 2597); and Watkins-Johnson Corp., Palo Alto, CA (project 2597).

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 2463 Mark XII Identification Friend or Foe (IFF) Program: Present Identification Friend or Foe (IFF) equipment is In a tactical theater 'as a means of distinguishing friend from foe or neutral. The work has evolved to defining and developing modifications to improve the performance and operational availability (i.e., reliability/supportability, electromagnetic compatibility, self interference and jam resistance) of existing equipment. The program places emphasis on the design of improvements that can be easily installed during routine field-level maintenance activities. Pre-production development, test and production/retrofit planning for modifications to existing transpondors and interrogators was completed in FY 1982. The modifications' improvement to jam resistance were not as great as originally expected, however, other improvements (i.e., reliability/supportability and equipment compatibility) provided by the modifications are being evaluated and a determination will be made in FY 1983 on their implementation into Mark XII equipments. Also, beginning in FY 1983 and continuing in FY 1984 additional improvements will be investigated for possible development. These include such things as improved built-in-test, taxiway interrogator tester and electronic code loading to replace the current mechanical keying system.

B. Project: 2751 Indirect Identification Subsystems: Reliable means of identifying enemy weapon systems at distances that exceed their lethal range is needed to allow our forces to limit their exposure to enemy weapons while still taking full advantage of our own weapons' capabilities and prevent fratricide.

This project involves the development and demonstration of techniques to use existing sensor, processing, and communications systems to collect, correlate and disseminate identification information from a variety of command and control elements to the weapon system users. Initial efforts will use automatic data processing and display coupled with limited electronic support measures data

Program Element: #64725F
DOD Mission Area: #344 - Tactical Command and Control

Title: Combat Identification Systems
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to demonstrate the feasibility of using this type of data in improving the overall identification process. In FY 1982 planning and coordinating activities in support of a European theater demonstration of improved indirect identification was conducted. These activities will continue in FY 1983 in support of the development of hardware and software to integrate, display, and automate the identification function. This will culminate in an in-theater demonstration of the improved capabilities beginning in FY 1984 and support efforts to plan for incorporation of these techniques into the Tactical Air Control System.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: 2597 Noncooperative Identification Subsystems

A. Project Description: Beyond visual range identification of airborne targets is

In March 1978, North Atlantic Treaty Organization (NATO) Long Term Defense Program Task Force Five on Air Defense

Similarly, the need for improved identification capability has been documented by Tactical Air Forces Statements of Operational Need 304-79 and 305-79 and more recently in a Joint Mission Element Need Statement approved by the Secretary of Defense on 30 October 1980.

several complementary cooperative and noncooperative identification techniques as well as their integration are being developed under the Air Force led, Tri-Service Combat Identification System Program. This project accomplishes the engineering development of the most promising methods for noncooperative target identification. Primary emphasis is on techniques that can be applied to the F-15 and F-16 aircraft during the mid 1980s. Included in these techniques is the Dual Mode Recognition technique whi

Another technique using radio frequency emissions from the target aircraft to perform long-range, adverse weather identification passively, is being investigated. This project will also develop the capability to integrate and correlate identification information from multiple sources onboard the weapon system. Also, noncooperative identification technology is being applied to adapt electronic support measures equipment to support the near-term demonstration of improved indirect identification capabilities and future architecture implementation of the indirect capabilities into the Tactical Air Control System.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The feasibility demonstration of off-the-shelf, radio frequency sensor technology to perform airborne targe identification passively was successfully completed. Engineering development support was provided to the F-16 program office for application of the Dual Mode Recognition (DMR) noncooperative identification algorithm to the F-16 radar. This involves the translation and integration of the DMR algorithm software into the radar/program signal processor architecture. Additionally, work in preparation for a near-term, in-theater demonstration of improved indirect identification capabilities was conducted. Besides the development and planning in support of the actual demonstration, this involved the development and integration of noncooperative identification technology for use

in the European demonstration at a Tactical Air Control System/Control and Reporting Center. The demonstration is expected to provide a basis for transitioning an improved identification capability to the command and control systems.

(2) FY 1983 Program: A design study will be initiated to determine the utility of integrating passive, radio frequency identification technology into existing tactical aircraft (e.g., F-16), and the frequency coverage and processing capability of the sensor demonstrated in FY 1982 will be increased. Also, engineering support will be provided to the F-16 for application and refinement of the Dual Mode Recognition noncooperative identification algorithm

Additionally, the near-term, in-theater demonstration of improved indirect identification capabilities will be transitioned and continued under Project 2751. In addition, initial planning activities will begin in support of the expected transition to engineering development of onboard integration of identification data from multiple sources. Also, efforts in support of developing a miniaturized version of a Mark XII interrogator for incorporation into the F-16 will be conducted.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Based on the results of the FY 1983 design study, engineering development activity will begin to support the integration of passive, radio frequency identification technology into existing tactical aircraft (e.g., F-16 radar). Work on providing the F-16 with a Mark XII interrogator capability to identify friends will continue. Also, engineering development and tests in support of the applications of the Dual Mode Recognition algorithm to the F-16 radar will be completed and incorporation of the initial algorithm into the improved production line radar will be accomplished. Additionally, noncooperative identification technology will be applied to selected ground based sensors in support of the European theater demonstration of improved indirect identification capabilities. Also, engineering development of the onboard integration of identification data from multiple sources will begin with initial emphasis on application to the F-15 aircraft. Cost estimates are based on parametric analyses conducted by the Combat Identification System program office during the summer of 1982. The funding maintains an outyear development schedule that will support the mid 1980s incorporation of passive identification, Mark XII interrogation, and Dual Mode Recognition capabilities on the F-16 as well as the multi-source integration algorithm on the F-15.

(4) Program to Completion: Engineering development activity in support of the integration of passive, radio frequency identification technology into existing tactical aircraft will be completed as will a miniaturized Mark XII interrogator. The Dual Mode Recognition Algorithm will be improved. Also, other noncooperative target recognition techniques

will be selected for engineering development and/or enhancement as their utility is demonstrated through advanced development or other suitable means. In addition, the development and refinement of the onboard integration of identification data from multiple sources will continue after its initial incorporation on fighter aircraft. This is a continuing program.

Program Element: #64725F
DOD Mission Area: #344 - Tactical Command and Control

Title: Combat Identification Systems
Budget Activity: #4 - Tactical Programs

C. MAJOR MILESTONES:

Milestones:	Dates:
(1) Incorporation of Dual Mode Recognition into F-16 Production Radar	
(2) European theater Demonstration of Improved Indirect Identification Capabilities	Dec 1984
(3) Begin Engineering Development of Multi-Source Integration Algorithm	1984
(4) Complete Development of F-16 Mark XII Interrogator	1985
(5) Decision on Approach for Incorporation of Passive Identification Capabilities	1984

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 64733F
DOD Mission Area: #224, Defense Suppression

Title: Surface Defense Suppression
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	6,332	4,740	1,916			188,224
2147	Imaging Infrared Seeker Integration	5,144	3,345	1,916			42,224
2195	Modular Guided Weapon System	1,188	1,395				123,500
2225	Weapon System Integration						22,500

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program develops the GBU-15 Modular Guided Weapon System. This weapon is a 2000 lb class guided glide bomb designed to destroy high value targets (interdiction) and enemy surface-to-air defenses (defense suppression). The in-production GBU-15 with television and data link (TV/DL) is optimized for low altitude launch allowing precise delivery while providing standoff range to the delivery aircraft. This combination of low altitude delivery and standoff reduces exposure of the delivery aircraft to enemy defenses. This program provides modular improvements to GBU-15 to extend its effectiveness against key targets. Key development areas address nighttime and limited adverse weather capability.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

RDT&E	9,564	4,740	0	0	0	186,711
Other Procurement (PE #28030F)	67,741	47,321	100,908	105,960	229,727	571,879
Aircraft Procurement	15,975	9,600				41,375

- IIR seeker production delays caused reduced FY82 effort and extension of RDT&E into FY84.

- Change in actual prior year expenditures

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Other Procurement (PE #28030F)	67,741	47,321	50,216	129,560	295,043	626,203**
(Quantity)	(340)	(250)	(250)	(525)	(1070)	(2540)*
Aircraft Procurement (3010)						
P-1900	6,475	9,600	0	0	0	31,235

Program Element: # 64733F | Title: Surface Defense Suppression
DOD Mission Area: #224, Defense Suppression | Budget Activity: #4, Tactical Programs

P-1100	7,500	0	0	0	0	7,500
TOTAL 3010	13,175	9,600	0	0	0	38,735

*Represents Current Buy

**Includes reduced FY 84 procurement due to fiscal constraints

5. (U) RELATED ACTIVITIES: Related and supporting efforts are pursued in Program Element (PE) 64606F, Conventional Standoff Weapon and PE 64608F, Close Air Support Weapon System. PE 64606F develops a conventional standoff weapon of greater capability than the GBU-15; PE 64608F develops an imaging infrared seeker to be used on the Air Force and Navy versions of the MAVERICK and GBU-15. PE 64606F also includes the development of a jam-resistant data link for the conventional standoff weapon; this data link may have application to the GBU-15, although this is not the focus of the effort.

6. (U) WORK PERFORMED BY: Program management is provided by Headquarters, Air Force Systems Command (AFSC), Andrews AFB MD, and Armament Division (AD), Eglin AFB FL. Major contractors are Rockwell International, Columbus OH and Hughes Aircraft Co, Culver City/Canoga Park CA.

7. (U) GBU-15 (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984)

A. (U) Project Description: Imaging Infrared Seeker Integration. This project develops, integrates and tests an imaging infrared (IIR) seeker for the GBU-15. The in-production GBU-15 with television seeker provides an effective capability for standoff, precision weapon delivery during conditions of daylight with moderate-to-good visibility at very low attitudes. The IIR seeker extends this capability into conditions of night and limited haze.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Development, Test and Evaluation (DT&E) flight testing for the GBU-15 IIR seeker was initiated. Captive flight missions were used to train aircrews, to gather data on operational effectiveness, tactics and environment and to test the integration of the IIR seeker with the weapon data link and data link pod. The IIR seeker acceptance specifications were finalized.

(2) (U) FY 83 Program: Finish DT&E flight testing with the launching of four GBU-15 IIR weapons. Initiate operational flight testing to demonstrate the capability of this system to accurately attack high-value targets during night and haze conditions. Eleven weapons will be launched. Support equipment for the IIR seeker will be updated to a production configuration.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Finish operational flight testing. Prepare for and conduct a production decision on the IIR seeker. Assuming a favorable production decision, begin transition from the television version to the IIR configuration.

Program Element: # 64733F
DOD Mission Area: #224, Defense Suppression

Title: Surface Defense Suppression
Budget Activity: #4, Tactical Programs

(4) (U) Program to Completion: The production of the GBU-15 will continue, in the IIR version, assuming a favorable production decision is made; otherwise production will continue using the television version.

C. (U) Major Milestones:

Milestones:		Dates:
GBU-15/TV/DL	Initial Production Contract Award	Sep 80
GBU-15/TV/DL	Initial Production Delivery	Jan 82
GBU-15/IIR	DT&E Start	Jul 82
GBU-15/IIR	IOT&E Start	Mar 83
GBU-15/IIR	Production Decision	May 84

Budget Activity: Tactical Program, #4
Program Element: #64733F, Surface Defense Suppression

Test and Evaluation Data

1. (U) Development Test and Evaluation:

(U) The Glide Bomb Unit GBU-15(V)/B Modular Guided Weapon System is a family of guidance and control and airfoil modules which, when combined with either the MK-84 General Purpose Bomb or the Cluster Bomb Unit CBU-75A/B Cluster Warhead can be configured for various attack and target conditions. The GBU-15 utilizes a Cruciform Wing airfoil optimized for low level standoff delivery. Following completion of Congressionally directed testing in March 80 and recertification by the Deputy Secretary of Defense, the GBU-15(V) 1/B has been approved for production; a contract for the initial United States Air Force production with a follow-on option was awarded in September 80 to Rockwell International. This version employs a television/data link guidance to allow the standoff delivery of the MK-84 bomb against high value, heavily defended targets requiring precise hitting accuracy. Development effort is continuing to integrate and test an imaging infrared guidance based upon the Maverick seeker to provide attack capability during conditions of night and light haze. A Planar Wing Weapon variant developed under this program element has been redesignated as the GBU-20(V). Due to substandard test results of that weapon and fiscal constraints, further development and test of the GBU-20 has been suspended.

(U) The development contractor for the GBU-15 is Rockwell International Corp., Columbus, OH. Program management is provided by Headquarters, Air Force Systems Command, Andrews Air Force Base, MD, and its subordinate organization, Armament Division, Eglin Air Force Base, FL. The GBU-15 testing consisted of a development test and evaluation effort, conducted by Air Force Systems Command, and a combined development test and evaluation/initial operational test and evaluation conducted by Tactical Air Warfare Center, Eglin Air Force Base, Fl. A total of 44 GBU-15s have comprised the Development Test and Evaluation portion of the test program. Mass simulation vehicles were used to verify aircraft handling and safe jettison characteristics (six MK-84 and three CBU-75A/B on F-4 and eight MK-84 on F-111). Six weapons were preprogrammed MK-84 vehicles launched from an F-4 to verify weapon response to initial autopilot design. Seven were equipped with distance measuring equipment (two MK-84 and five CBU-75A/B). Six MK-84 weapons were launched from an F-4 using television guidance in the lock-on-before-launch profile. Eight weapons were equipped with data link guidance and MK-84 warhead; three launched from an F-4, two from a B-52, and three from an F-111. All flight tests were conducted at Eglin Air Force Base, Fl. with the exception of distance measuring equipment tests which were conducted at White Sands Missile Range, NM. and the F-111 integration tests conducted at China Lake, CA. Fuzing systems used were the FMU-124A/B for the MK-84 and the FMU-123/B for the CBU-75 warhead. Results of the FMU-124 reliability testing was .968 at the 90 percent confidence level (requirement is .95/90 percent). An extensive series of captive flight tests was also conducted at Eglin Air Force Base, FL. to evaluate airborne data link pod coverage and evaluate Electronic Counter Measures/Electro Magnetic Interference capability of both the GBU-15 and the AN/AXQ-14 data link pod. Ground tests included radar cross section testing and testing to determine the antenna pattern coverage of the AN/AXQ-14

Budget Activity: Tactical Program, #4
Program Element: #64733F, Surface Defense Suppression

data link pod on the F-4, F-111, and B-52. Major changes for Initial Operational Test and Evaluation weapons included improvements in the autopilot for low level launch capability. Required modifications as a result of the Development Test and Evaluation program were incorporated into the Initial Operational Test and Evaluation test hardware.

(U) Hardware reliability has been examined throughout the GBU-15 test program. The cumulative demonstration mean time between failure throughout the Phase I-Phase IV Initial Operational Test and Evaluation testing was 25.1 hours versus an established standard of 14.2 hours. The goal established for out of box reliability (initial checkout) for the development pre-production hardware used in the Phase III and IV Initial Operational Test and Evaluation was 92 percent at the 85 percent confidence level. The initial test pass rate for Phase III and IV was nine weapons checked, eight passed, for 89 percent. The use of hard tooling, circuit board redesign, full electronics "burn in" and decreased "touch labor" during manufacturing are expected to improve the out-of-box reliability of the production hardware. The out-of-box reliability specification for the production hardware is 95 percent and will be checked during the Follow-on Operational Test and Evaluation. The initial United States Air Force production contract for GBU-15 with Television guidance was awarded in September 80; initial production deliveries began in January 82. With the exception of producibility changes, the Initial Operational Test and Evaluation hardware represents the form, fit, and function of the hardware being procured. Follow-on Operational Test and Evaluation using production GBU-15s is planned during October 82-April 83. The GBU-15 with Television guidance satisfactorily passed the environmental qualification tests as required by Military Standard 810B.

(U) The integration of the Maverick Imaging Infrared seeker into the GBU-15 will extend GBU-15 operation into conditions of night and light haze. Advanced development module testing was conducted during the period 1 August 1979-31 December 1979. This testing was designed to evaluate the functional aspects of hardware design and investigate some operational use concerns. Imaging Infrared seekers and GBU-15 weapon modules were acquired through 1982 to support Development Test and Evaluation/Initial Operational Test and Evaluation. Development Test and Evaluation began in July 1982. Initial Operational Test and Evaluation is scheduled for March 1983-February 1984. The principal test site for Development Test and Evaluation/Initial Operational Test and Evaluation will be Eglin Air Force Base, FL. A Test and Evaluation Master Plan has been prepared identifying specific development, operational effectiveness, and operational suitability objectives. Specific measures of effectiveness have been developed for each objective and published in the Development Test and Evaluation and Initial Operational Test and Evaluation Test Plans.

Budget Activity: #4, Tactical Programs
Program Element: 64733F - Surface Defense Suppression

Test and Evaluation Data

2. (U) Operational Test and Evaluation Data:

a. (U) GBU-15/Cruciform Wing Weapon (CWW)/Television/Data Link.

(1) (U) The testing of this weapon was accomplished in four phases. Phases I and II were combined Development Test and Evaluation/Initial Operational Test and Evaluation (DT&E/IOT&E) conducted by the Armament Division and the Tactical Air Warfare Center (TAWC), October 1975-December 1977. The IOT&E Report was published in November 1978 (TAC Project 75C-003T, GBU-15 CWW DT&E/IOT&E Phase I and II, Secret). Phases III and IV were additional IOT&E conducted by TAWC (Phase III, May 1978-June 1979; Phase IV, October 1979-February 1980). Phase III/IV IOT&E Report was published in May 1980 (TAC Project 75C-003T, GBU-15 CWW IOT&E Phase III and IV, Secret). Both reports are available through the Defense Technical Information Center, Cameron Station, Alexandria, Virginia 22314.

(2) (U) For all four phases of the test program, the Air Force Test and Evaluation Center (AFTEC) approved the TAWC test plans, monitored the testing, and provided independent comments on the test results to the Chief of Staff, United States Air Force.

(3) (U) In addition to the GBU-15 IOT&E, four weapons were launched during other programs. Three weapons were launched during the F-111F PAVE TACK DT&E/IOT&E, and one weapon was launched during the Precision Guided Munitions Demonstration for the Secretary of Defense at White Sands Missile Range, NM, December 1978.

(4) (U) The following is a summary of test results:

(a) A total of 21 GBU-15 IOT&E launches were conducted: 17 from the F-4E and four from the F-111F.
One of the failures was hardware related; during launch of Phase IV, the weapon directional/vertical gyro failed to uncage. Two launch failures were operator induced, and one launch failure was weather related.

(b) Of the 21 launches, 12 weapons were launched at a release altitude below 500 feet above ground level. The gyro malfunction accounted for one of the failures; the other failure was due to operator error (weapon launched out of envelope).

(c)

Budget Activity: #4, Tactical Programs
Program Elements: 64733F - Surface Defense Suppression

(5) (U) A follow-on operational test and evaluation (FOT&E) of the GBU-15/TV weapon is being planned by the Tactical Fighter Weapons Center. The test, scheduled October 82 to April 82, will consist of 18 weapons launches from the F-4E PAVE TACK and F-111F PAVE TACK aircraft. Emphasis during FOT&E will be placed on the development of additional tactics to enhance GBU-15 employment and verification that deficiencies noted during IOT&E have been corrected.

b. (U) GBU-15 CWW/Infrared (IR)/Data Link.

(1) (U) The Air Force is currently planning for an IOT&E of the GBU-15 CWW/IR weapon in the March 1983 to February 1984 time period. AFTEC has been designated as the OT&E agency to conduct this IOT&E which will consist of 11 weapons launches from the F-4E PAVE TACK aircraft (seven weapons) and the F-111F PAVE TACK aircraft (four weapons). In addition, 65 captive-carry sorties, using both of the above aircraft, will be flown to generate approximately 300 passes from which data on target acquisition, acquisition ranges, and effects of weather can be obtained and evaluated.

(2) (U) The principal test sites will be Eglin AFB, Florida, and Naval Weapons Center, China Lake, California. Captive-carry missions will be flown off range against realistic targets in the southeastern and northwestern US. On-range targets for actual weapon launches will be selected for the degree to which they represent real world targets. Tactical Air Command aircrew and maintenance personnel will participate throughout the IOT&E.

c. (U) GBU-20 (formerly designated the GBU-15 Planar Wing Weapon)

(1) (U) Between April 1977 and August 1979, a combined DT&E/IOT&E of the GBU-20 was conducted to evaluate this weapon for employment by the B-52D. AFTEC was the OT&E agency for this test. The IOT&E Report, published in December 1979 under the title B-52D/GBU-15 PWW IOT&E, is available from the Defense Technical Information Center.

(2) Based upon test results,

(3) The GBU-20 program was officially terminated by HQ USAF PMD, 26 May 1981.

Budget Activity: Tactical Program, #4
Program Element: #64733F, Surface Defense Suppression

3. System Characteristics:

CRUCIFORM WING WEAPON/MK-84/TELEVISION/DATA LINK TECHNICAL CHARACTERISTICS

Characteristic	Objective	Threshold	Demonstrated[1]
Maximum Mach			
Maximum Altitude (feet)			
Minimum Altitude (feet)			
Range (Nautical Mile)			
Accuracy (feet) (Circular Error Probable)			
Reliability (weapon hardware inflight)			

1 Demonstration of parameter maximum was not necessarily a test objective.
2 Data not specified in technical specifications
3 Tactical Air Command goal for Initial Operational Test and Evaluation
4 Demonstrated during Development Test & Evaluation/Initial Operational Test and Evaluation Development Test and Evaluation/Initial Operational Test and Evaluation program conducted by Tactical Warfare Center.
5 Demonstrated during Development Test and Evaluation program conducted by Air Force Systems Command

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64737F
DOD Mission Area: #371 - Self Protection

Title: Airborne Self Protection Jammer (ASPJ)
Budget Activity: #4 - Tactical Programs,

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	54,096	46,726	42,241	18,041	Continuing	N/A
2712	ASPJ Common Development	31,200	27,637	20,657	5,997	Continuing	N/A
2715	ALQ-131/CPMS Development/ Integration	7,954	5,789	6,284	1,444	0	27,702
2719	F/16/ASPJ Development/ Integration	14,942	13,300	15,300	10,600	0	57,218

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Airborne Self Protection Jammer (ASPJ) designated as the ALQ-165 is a joint Air Force/Navy engineering development program for an internally mounted electronic countermeasures (ECM) system that will provide self protection and increase the probability of aircraft survivability when various tactical aircraft (F-16, F-14, F/A-18, A-6E, and EA-6B) are confronted by modern diversified radar controlled weapon systems. Development of associated support equipment, alternate technology and aircraft integration are included. Also included is development of a Comprehensive Power Management System (CPMS) for the USAF ALQ-131 ECM Pod to be carried by those aircraft not programmed for ASPJ. Major component, subsystem and system development will continue through the full scale production decision. Engineering Development Model systems will undergo effectiveness, qualification, and reliability testing. These systems will also be used to prototype aircraft installations.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

(U) RDT&E	54,096	46,726	35,133		Continuing	Not Applicable

(U) FY 1984 increase is the result of revised inflation indices, cost of adding additional capability to respond to the latest threat assessment and the development of support equipment.

Program Element: #64737F
DOD Mission Area: #371 - Self Protection,

Title: Airborne Self Protection Jammer (ASPJ)
Budget Activity: #4 - Tactical Programs,

4. (U) OTHER APPROPRIATION FUNDS:

(U) Procurement (Aircraft) PE 27133F (F-16)

5. (U) RELATED ACTIVITIES: This program is structured as a joint Navy/Air Force effort with Navy funds provided under PE 64226N, Advanced Self Protection Systems. It is the intent of this program to attain 100% commonality of the ASPJ system design for internal application and to equally share the total Group B cost of engineering development between the two Services. The Air Force and Navy joint development efforts were initiated during FY 1979. Air Force funds were provided under PE 64738F, Protective Systems and PE 64739F, Tactical Protective Systems. In FY 1980 Air Force direction and funds for this effort were consolidated under PE 64737F, Airborne Self Protection Jammer. The F-16 internal ECM (IECM) efforts are directly related to PE 27133F, F-16 Squadrons. The ALR-74 Radar Warning Receiver program is being interfaced with the ALQ-165 to insure compatibility.

6. (U) WORK PERFORMED BY: ASPJ development is managed by a joint Navy/Air Force Program Office at the Naval Air Systems Command, Washington, D.C. The Navy is the lead Service. The Air Force unique portion of this program, integration of CPMS into the ALQ-131 and ASPJ into the F-16, is managed by the Aeronautical Systems Division, Wright-Patterson AFB, OH with assistance by AFLC, Wright-Patterson AFB, OH. The ASPJ/CPMS Phase I design effort was accomplished by two competitive contractor teams. One team was Northrop Corporation, Rolling Meadows, IL and Sanders Associates, Nashua, NH. The second team was ITT, Nutley, NJ and Westinghouse Corporation, Baltimore, MD. The ITT/Westinghouse team was selected during FY 1981 to proceed into Phase II (full scale engineering development) to develop engineering development models. Integration of ASPJ into the F-16 is being accomplished by General Dynamics, Fort Worth, TX.

7. PROJECTS LESS THAN $10 MILLION IN FY 1984: Project 2715, ALQ-131/CPMS Development/Integration: This project adapts the receiver/processor portion of the ALQ-165/ASPJ to provide an enhanced power management capability (Comprehensive Power Management System/CPMS) for the ALQ-131 electronic countermeasures (ECM) pod. CPMS will have a capability to detect [ ] radars. ALQ-131 ECM pods will be used on aircraft not scheduled to be equipped with the ASPJ internal ECM system, such as the A-7D, A-10, and F/RF-4. In FY 1982 the critical design review was completed and Phase II, Engineering Development Model fabrication, assembly and testing was initiated. In FY 1983, Phase II, Engineering Development Model fabrication, assembly and test, of the CPMS development will continue. Delivery of engineering development models will commence early phases of Development Test and Evaluation. For FY 1984 the planned program is to complete Development Testing and initiate Operational Testing.

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: 2712, ASPJ Common Development

A. Project Description: This project funds the Air Force's share of the joint Navy/Air Force common development of the Airborne Self Protection Jammer (ASPJ), ALQ-165. This development is required to increase Air Force and Navy tactical aircraft survivability and provide an enhanced probability of mission success. The Research, Development, Test and Evaluation effort leading to the ALQ-165 is required to develop advanced electronic countermeasures techniques for countering projected threats

Program Element: #64737F
DOD Mission Area: #371 - Self Protection,

Title: Airborne Self Protection Jammer (ASPJ)
Budget Activity: #4 - Tactical Programs,

Sixteen ASPJ Engineering Development Models will be used for system effectivenes evaluation reliability testing, qualification testing and Initial Operational Test and Evaluation.

B. (U) Program Accomplishments and Future Programs:

1. (U) FY 1982 Accomplishments: Phase II, Engineering Development Model fabrication, assembly and test, of the ALQ-165 development commenced. F-16 integration work continued. An OSD Review was held in January 1982 which approved the continuation of full scale development and encouraged expeditious fielding of the ASPJ.

2. (U) FY 1983 Program: Phase II of ALQ-165 development will continue and delivery of the Engineering Development Models (EDM) will commence. The test, analyze, and fix portion of the program will begin.

3. (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Continue delivery of EDMs. Complete the test, analyze and fix program. Complete Development Test and Evaluation of the ALQ-165 in the F-16A. Operational Test and Evaluation will commence.

4. (U) Program to Completion: Complete Operational Testing. Obtain a production decision at the Defense Systems Acquisition Review Council (DSARC) III. Commence production.

C. (U) Milestones:

	Milestone	Date
A.	DSARC-II	July 1979
B.	USAF becomes a full participant in ASPJ program	January 1980
C.	Critical Design Review	January 1981
D.	Phase II contract award	August 1981
E.	OSD DSARC Program Review (DSARC-IIB)	January 1982
F.	Engineering Development Model delivery begins	3rd Quarter FY 83
G.	Complete TECHEVAL in F-16	4th Quarter FY 84
H.	Complete OPEVAL in F-16	3rd Quarter FY 85
I.	Full rate production approval (DSARC-III)	4th Quarter FY 85

9. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: 2719, F-16/ASPJ Development/Integration

A. (U) Project Description: This project supports the integration of the Airborne Self Protection Jammer (ASPJ) (ALQ-165) in the F-16 aircraft. The ALQ-165 is a joint Navy/Air Force program to develop an internal electronic countermeasures capability for self protection of tactical aircraft (F-16, F-14, F-18, A-6E and EA-6B) to enhance mission success and aircraft survivability when confronted by modern, diversified, radar controlled weapon systems.

B. (U) Program Accomplishments and Future Programs:

Program Element: #64737F
DOD Mission Area: #371 - Self Protection,

Title: Airborne Self Protection Jammer (ASPJ)
Budget Activity: #4 - Tactical Programs,

1. (U) FY 1982 Program Accomplishments: Pre-prototype engineering efforts for installation of the Airborne Self Protection Jammer in the F-16 were continued.

2. (U) FY 1983 Program: Complete prototype engineering efforts. Begin installation and check-out of the Airborne Self Protection Jammer in the F-16.

3. (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: : Continue deliveries of development models. Complete the test, analyze and fix program. Complete Development Testing and initiate Operational Testing.

4. (U) Program to Completion: Complete Operational Testing in the F-16. Obtain production decision for the Airborne Self Protection Jammer and commence production line installation of systems in F-16 aircraft.

C. (U) Milestones:

	Milestones	Date
A.	Associate Contractor Agreement	September 1980
B.	Begin Prototype Installation	3rd Quarter FY 83
C.	Complete Prototype Installation	1st Quarter FY 84
D.	Complete TECHEVAL in F-16	4th Quarter FY 84
E.	Complete OPEVAL in F-16	3rd Quarter FY 85

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: 64738F — Title: Protective Systems
DOD Mission Area: #371 - Self Protection — Budget Activity: #4 - Tactical Programs

1. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	111,221	108,087	49,969	40,616	Continuing	N/A
1627	Simulation, Analysis and Evaluation	7,300	11,400	10,000	9,500		
2114	Antenna Test Range	1,400	1,800	1,800	1,900		
2683	Radar Countermeasures	40,350	18,500	400			
3829	Infrared and Optical Countermeasures	200	4,900	10,000	9,400		
5615	Strategic Protective Systems	47,430	65,176	18,169	13,316		
5616	F/FB-111 Protective Systems	200	6,311	9,600	6,500		

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Soviets continue to develop, deploy and provide their allies with sophisticated electronic and electro-optical aircraft detection and tracking equipment and sophisticated surface-to-air and air-to-air weapon systems. Recent introduction of new and improve threat systems combined with additional diversity into previously unused frequency bands and the introduction of to assist in weapon direction are of particular concern. These actions make it imperative that Air Force aircraft countermeasures equipment be improved to insure adequate survivability and resulting successful accomplishment of assigned wartime missions. This program element accomplishs full-scale engineering development of countermeasures capabilities to negate the effects of hostile radar, infrared optical, electro-optical and threat systems. It funds (1) engineering development of new or improved electronic countermeasures (ECM) equipment for strategic and tactical aircraft; (2) development of infrared, optical an counter-measures equipment for strategic, tactical and combat support aircraft; (3) expedited development and integration of

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Program Element: 64738F — Title: Protective Systems
DOD Mission Area: #371 - Self Protection — Budget Activity: #4 - Tactical Programs

electronic countermeasures techniques which are effective against highly ECM resistant and widely deployed radars; (4) the maintenance and updating of computer threat simulations for evaluation and analysis of electronic warfare equipment; and (5) development of an antenna test range to support both ground and airborne evaluation of new electronic warfare antennas.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	108,491	110,234	53,148	Continuing	N/A

A. Project 1627: Increases in FY 83 to accelerate urgently needed modifications to [ ] radar simulations to support development schedules.

B. Project 2683: Increases in FY 83 to permit accomplishment of more thorough studies for integration of techniques into applicable aircraft/countermeasures systems.

C. Project 3829: FY 82/83 funding reduced due to [ ] in pyrophoric flare development. Funding increased in FY 84 to accelerate work on pyrophorics, electro-optical and [ ] detection and countermeasures.

D. (U) Project 5615: FY 82 development funding increased due to antenna design changes which will yield significant production cost reductions. FY 83 funding increased to accommodate a minor increase in scope. FY 84 funding decreases due to funding limitations.

E. Project 5616: FY 82 funding reduced due to delays in contract negotiation. FY 83 reduced to support other higher precedence objectives. FY 84 increased to emphasize [ ] countermeasures development/integration tasks.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands): Not Applicable

5. (U) RELATED ACTIVITIES: Not Applicable

6. (U) WORK PERFORMED BY:

General Dynamics Corporation, Fort Worth, Texas (Project 1627/5616)
International Telephone and Telegraph, Avionics Division, Nutley, New Jersey (Project 5615)
Boeing Military Airplane Company, Wichita, Kansas (Project 5615)
Radio Corporation of America, Van Nuys, California (Project 5615)
Hughes Aircraft Company, Culver City, California (Project 5615)
Air Force Systems Command, Aeronautical Systems Division
Wright Patterson Air Force Base, Dayton, Ohio

Program Element: 64738F Title: Protective Systems
DOD Mission Area: #371- Self-Protection Budget Activity: #4 - Tactical Programs

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project 2114: Antenna Test Ranges. This project maintains several ranges for use in antenna development and testing. The ranges are equipped with actual aircraft and permit antenna placement and pattern testing prior to flight testing, providing a low cost alternative to extensive flight testing. The FY 82 developmental work calibrated the ranges for use up to FY 83 and FY 84 funding will add additional airframes and begin to certify the ranges to increased frequencies, initially to wavelength and ultimately to frequencies.

B. Project 3829: Infrared and Optical Countermeasures. Deployed Soviet infrared missiles utilize of existing infrared decoy flares. This project funds development of improved flares for all USAF aircraft and, because of dispenser commonality, will provide a flare usable by most NATO Air Forces. The project also develops detection and countermeasure devices for all USAF aircraft. Funding in FY 82 was reduced due to new development. The FY 83 and 84 funding will expedite flare development and begin development of detection capabilities.

C. Project 5616: F/FB-111 Protective Systems. This project funds full scale engineering development of countermeasures capabilities required for the F/FB-111 aircraft. FY 82 efforts to install a tail missile approach warning system were delayed due to contracting problems. FY 83 and 84 will continue this effort, update countermeasures capabilities by integrating techniques and begin work to expand countermeasures capabilities into the frequency range.

8. (U) PROJECT OVER $10 MILLION IN FY 84:

(U) Project 1627: Simulation, Analysis and Evaluation

A. Project Description: This project provides for development, fabrication and validation of laboratory simulation of radar systems for detailed development and evaluation of potential countermeasures systems and techniques. This facility provides realistic laboratory simulations of ground-to-air and air-to-air threat systems (including cockpits for air-to-air system evaluation) to permit effective definition, design and evaluation of new/improved countermeasure equipment under precisely controlled environments. This permits extensive testing before flight test at a fraction of flight test costs for similar efforts. Simulations are updated based on availability of funding and intelligence information.

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: The FY 82 program continued preliminary planning and fabrication of radar simulations. In addition, simulations were updated. Development of a simulation was begun to support full scale engineering development initiatives.

(2) FY 83 Program: Updates for the will near completion. Updates for the to include a new for the latter, will begin as will a major update on the Development of a

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associated with will also begin. Threat validation and other instrumentation improvements will continue, as will the development of simulations. simulation development will also continue.

(3) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Development of the simulation will continue as will development of th airborne radar simulations. The missile and guidance simulation updates will be completed. The simulation will be completed to support full scale engineering development testing of non-lethal countermeasures techniques. The upgrade will be completed. New starts will include development of a chaff model and the expansion of the Multiple Emitter Generator simulation to permit simulations versus the current limitation. Cost estimates are prepared by HQ AFSC.

(4) (U) Program to Completion: This is a continuing program. Modernization and updating will be planned based on funding and intelligence data availability.

C. (U) Major Milestones: Not applicable

9. (U) PROJECT OVER $10 MILLION IN FY 1984 (CONT)

(U) Project: 5615 Strategic Protective Systems

A. Project Description: The continued emphasis on improvements in quantity, quality and diversity of air defense and command/control systems establishes a corresponding need to provide improved self protection countermeasures systems for strategic aircraft. This project provides for development of new and improved electronic countermeasures for strategic bombers and the AGM-86B cruise missile.

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: Development of the ALQ-172 countermeasures system continued. A major configuration change was effected to optimize this system for the Cruise Missile Carrier role while signifigantly reducing production complexity and cost. Development of the countermeasures system continued into flight test with results. This development program has met all design-to-cost, schedule and goals. Development of a nonlethal countermeasures system to negate the effectiveness of was initiated at congressional direction. This is a Quick Reaction Capability (QRC) development program.

(2) FY 83 Program: The ALQ-172 system fabrication, qualification and airframe integration will be completed with flight testing beginning in Jul 1983. The flight tests were completed. All reliability and design-to-cost goals have been met. This program has been terminated. The counter competitive development program continues with emphasis on jammer technique verification and initial system definition.

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(3) FY 84 Program and Basis for FY 1984 RDT&E Request: ALQ-172 flight testing will be completed in Dec with a production decision to follow shortly thereafter. Assuming production approval, final development of support equipment will be completed and the ALQ-172 prototype system will go to the AF Electronic Warfare Evaluation Simulator (described under Project 1627 above) for production software optimization. Full Scale Engineering development of the non-lethal counter system will continue with evaluation also against simulations described in Project 1627 above. This will continue to be a competitive development program. HQ AFSC analysis indicates that project funding is insufficient for the planned counter program and will result in an Initial Operational Capability (IOC) in The is projected to have an IOC in to provide the

(4) Program to Completion:

This project will continue to develop the counter capability and to develop cost effective system updates for strategic aircraft as the expanding threat base requires.

C. (U) Major Milestones: Not applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64739F — Title: Tactical Protective Systems
DOD Mission Area: #371 - Self-Protection — Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING):($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	20,709	28,093	34,889	37,164	Continuing	N/A
2272	Active Countermeasures Systems	11,609	12,993	13,289	16,464	Continuing	N/A
2273	Warning Systems	1,000	2,100	8,500	9,000	Continuing	N/A
2274	Dispensers and Expendables	900	100			Continuing	N/A
2879	EW Reprogramming Update		6,900	6,900	4,200	Continuing	N/A
5618	F-15 Protective Systems	7,200	6,000	6,200	7,500	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for the engineering development of new and improved self-protection electronic warfare (EW) equipment, to include rapid EW reprogramming update capability, for tactical strike, air superiority, airlift and reconnaissance aircraft. All projects in this Program Element are in response to: TAC ROC 9-68, Advanced Tactical Fighter for Aerial Combat, 1 February 1968; TAF SON 312-80, Optical Threat Acquisition and Cuing System, 10 October 1980; TAF SON 304-80 Tactical Self-Protection Electronic Warfare Systems, 9 May 1980; SAC SON 06-80, Rapid Reprogramming Capability, 3 June 1981; and MAC SONs 07-81, 08-81, 09-81, Defensive Systems for Airlift, Combat Rescue Helicopters, and Combat Rescue HC-130 aircraft, 8 Sep 1981.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	23,711	28,093	26,959		Continuing	N/A

FY 82: Funding in FY 1982 represents a reduction of $3,002 thousand to fund higher priority Air Force requirements. As a result of reductions, were delayed one year.

FY 84: Funding in FY 1984 was increased $7,930 thousand by OSD for development.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands) N/A

Program Element: #64739F

DOD Mission Area: #371 - Self-Protection

Title: Tactical Protective Systems

Budget Activity: #4 - Tactical Programs

5. (U) RELATED ACTIVITIES: The efforts in this program draw from technology developed in various other program elements (PE), such as PE 64738F, Protective Systems; PE 63718F, Electronic Warfare Technology; and PE 63743F, Electro-Optical Warfare. The F-15 Tactical Electronic Warfare System (TEWS) efforts are directly related to PE 27130F, F-15 Squadrons.

6. (U) WORK PERFORMED BY: This program element is managed at the Aeronautical Systems Division, Wright-Patterson Air Force Base, OH. The prime contractor for the ALQ-131 Advanced Tactical Countermeasures Pod updates is Westinghouse Electric Corporation, Baltimore, MD. The subcontractor for the ALQ-131 Improved Receiver/Processor (R/P) module for the pod is Loral Electronics Systems, Yonkers, NY. The major contractors for the F-15 TEWS are: Northrop Corporation, Rolling Meadows, IL (Internal Countermeasures Set), Loral Electronic Systems, Yonkers, NY (Radar Warning Receiver), Magnavox Company, Ft Wayne, IN (Electronic Warfare Warning Set), McDonnell Douglas Aircraft Corporation, St Louis, MO (aircraft integration and countermeasures dispenser) and Tracor Incorporated, Austin, TX (countermeasures dispenser). There are approximately 10 additional contractors performing work under this contract for a total dollar value of $3,000K.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: 2273, Warning Systems

This project funds development efforts for systems and subsystems which will provide new warning capabilities to detect the expanding enemy air-to-air and ground-to-air missile threats. Included are The A-10 vulnerability analysis was completed in FY 82 and full scale development of a system will begin in FY 83. Full scale development of a capability for current and next generation radar warning receiver (RWR) will begin in FY 83. Both efforts will continue development through FY 84.

B. (U) Project: 2274, Dispensers and Expendables

(U) This project provides for the development and improvement of dispensers, chaff, flares, and other expendables to counter the expanding air-to-air and ground-to-air threat. The FY 78 initiated development of the MJU-10 self-protection flare for the F-15 will complete testing and a production decision will be made in FY 83. The FY 80 initiated full scale development of a joint USAF/Royal Netherlands Air Force dual chaff cartridge capability for the ALE-40 dispenser system will complete in FY 1983. No new programs currently in planning stage. However, postulated threat information and changes in the current threat necessitate project continuation as a vehicle for implementing development programs to meet new threats.

C. (U) Project: 2879, Electronic Warfare Reprogramming Update

AFR 55-90, "Electronic Warfare Policy," directs implementation of the Electronic Warfare Integrated Reprogramming Concept to rapidly exploit sources to reprogram the software in computer driven airborne electronic warfare systems. The intent is to achieve rapid response to enemy radar operation and to technological surprise on the battlefield. The Electronic Warfare Reprogramming Update program provides SAC, TAC, MAC and AFLC automated tools to permit rapid analysis, assessment and trade-off decision making during the EW software reprogramming process. This process includes assessing impact of new intelligence on operational EW systems, establishing and selecting realistic reprogramming options for the EW system software, creating and documenting the change to the software program and keeping check of which software programs are installed in specific EW systems. This program updates the existing manual system to achieve a more rapid and accurate response while using less highly skilled personnel in the decision making process. The FY 82 effort consisted of refining the system specification, developing an acquisition plan including Statement of Work (SOW) and Request for Proposal (RFP) preparation, in addition to a source selection plan. The FY 83 effort will consist of finalizing the acquisition plan, awarding the contract, and procuring four hardware prototype systems. Hardware and software development and system integration efforts will be initiated in FY 84. Fixed site production decision will be made Oct 84.

D. (U) Project: 5618, F-15 Protective Systems

Continued development and deployment of sophisticated electronic defensive weapon systems necessitates modifying and updating the F-15 Tactical Electronic Warfare System (TEWS) so that the F-15 can effectively perform its air superiority mission. This project develops electronic warfare equipment for the F-15 aircraft which will provide self-protection while operating in the presence of hostile ground controlled fighter interceptors, surface-to-air missiles and antiaircraft artillery. The F-15 TEWS consists of four systems: ALR-56 Radar Warning Receiver (RWR), ALQ-128 EW Warning Set (EWWS), ALQ-135 Internal Countermeasures Set (ICS), and ALE-45 Countermeasures Dispenser Set (CMD). Flight testing of the ALE-45 CMD was completed in FY 82 and will enter production in FY 83. Development of memory expansion and modular software for the basic ALR-56A RWR completed in FY 82. Development of the updated ALR-56C RWR to provide the F-15 with a capability to detect threats will continue through FY 83. Simulator and flight testing will complete in FY 84 and a production decision will be made. A new effort will be initiated in FY 84 to provide the F-15 with a warning enhancement to the ALR-56C.

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: 2272, Active Countermeasures Systems

A. Project Description: This project provides for the development of improved electronic countermeasures (ECM) capability for inventory ALQ-131 ECM pods and for the development of new ECM capabilities, to include systems for tactical strike, reconnaissance and airlift aircraft. Updates to existing systems are required to eliminate deficiencies such as
The continued improvement in the quantity, quality, and diversity of , system creates a continuing need to improve the self-protection countermeasures capability for tactical strike, reconnaissance and airlift aircraft.

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: The ALQ-131 ECM and System Update Missionization Study (SUMS) was initiated to evaluate proposed capability updates and determine the most cost effective approach for the incorporation of new techniques and capabilities. The goal is to provide the ALQ-131 with a capability against the operationally deployed and postulated threat radars. The ALQ-131 Improved Receiver/Processor (R/P) continued DT&E flight testing during FY 82. The R/P

 1.35

Program Element: #64739F
DOD Mission Area: #371 - Self-Protection

Title: Tactical Protective Systems
Budget Activity: #4 - Tactical Programs

will provide the ALQ-131 with a power management capability to more effectively apply specific jamming techniques against specific threats on a prioritized basis. A Quick Reaction Capability development program (QRC 82-03 HAVE CHARCOAL) to provide protection of selected large aircraft (E-3A, VIP aircraft) against missiles was initiated in FY 82. measurements were completed on the C-141 and C-5 as part of the program to determine their vulnerability to the threat.

(2) FY 1983 Program: The ALQ-131 ECM pod SUMS will complete and planning for FY 84 initiation of improvement programs to provide the ALQ-131 ECM Pod with increased effectiveness against operationally deployed and postulated threat radars will begin. The ALQ-131 Improved R/P will complete flight testing and a production decision will be made. QRC 82-03 will complete Phase I competitive prototype bench tests and simulator testing and Phase II, competitive development of flight test units, will begin. measurement of USAF aircraft will continue in an effort to define appropriate self-protection suites.

(3) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: A critical update program will begin to provide the ALQ-131 ECM pod with a jamming capability against radar threats.
QRC 82-03, will enter competitive flight testing. The cost estimates for full scale engineering development are generated based on contracting history, experience with the development of similar systems and a competitive development program approach.

(4) Program to Completion: Updates to the ALQ-131 ECM pod will continue QRC 82-03 will complete flight testing and a production decision will be made in FY 85 for immediate installation on aircraft. This project is a continuing program.

C. (U) Major Milestones: N/A

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64740F
DOD Mission Area: #352, Air Warfare Command & Control

Title: Computer Resource Management Technology
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	4,882	4,497	7,860	12,331	Continuing	N/A
2239	Computer Security Technology	1,954	1,798	1,560	1,600	Continuing	N/A
2522	Requirements Analysis	422	707	800	948	Continuing	N/A
2523	Management Control Technology	247	100	350	400	Continuing	N/A
2524	Policy and Procedure Guidance	1,175	1,297	1,100	683	Continuing	N/A
2526	Software Engineering Tools and Methods	792	595	1,450	1,900	Continuing	N/A
2652	Computer Architecture Standards	292	0	100	100	Continuing	N/A
XXXX	Logistics Information Management Support System (LIMSS)		0	2,500	6,700	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF THE ELEMENT AND MISSION NEED: Air Force and Department of Defense studies have shown that the rapidly increasing cost of computer software diverts resources from other vital mission requirements. Increasing threat complexity has forced an increase in mission complexity and increased proliferation of digital computers and software. Current Department of Defense computer software costs (over $4 billion per year) are growing rapidly; this growth must be controlled. The goal of this program is to apply technology in the system acquisition and support process to reduce software life cycle cost and to improve the quality of weapon system software. Consisting of some 40 different tasks, this program element exploits the results of advanced development program; develops and applies techniques to reduce cost and increase reliability in complex automated defense systems; and provides users and system designers with improved computer equipment programming techniques, and information processing tools to specify, design, test and support automated defense systems. This program addresses identified deficiencies in the use and control of high order languages, in management and engineering approaches to computer software development, in the use of requirement and cost analyses, and in the application of comprehensive acquisition management procedures. The program is also the research and development arm of the Air Force multi-level computer security initiative. This program will also develop an information network that links together exisitng and planned logistics/engineering systems into a totally integrated LIMSS architecture.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

RDT&E	4,882	4,993	7,209	Continuing	N/A

- FY 83. (-496K) The 296K cut in project 2652 was a Congressional cut to preclude new starts in the MIL-STD-1750A Instruction Set Architecture (ISA) standardization program. The other 200K cut was to support higher priority projects.

Program Element: #64740F DOD Mission Area: Air Warfare Command & Control, #352

Title: Computer Resources Management Technology Budget Activity: Tactical Programs, #4

- FY 84. (+651) Represents the introduction of the Logistics Information Management Support System (LIMSS) into this program element.

4. (U) OTHER APPROPRIATION FUNDS: Not applicable.

5. (U) RELATED ACTIVITIES: This program supports and is responsive to the DOD Software Initiative and the DOD Ada Joint Program (PE63226F, DOD Common Programming Language (Ada)). It is related to other programs which constitute the DOD Software Science and Technology Program: 62701A, Communications Electronics; 62725A, Computer and Information Sciences; 63723A, Automatic Data Processing Equipment Development, 62721N, Command and Control Technology; 63526N, Advanced Computer Technology; 62708E, Distributed Information Systems; 62702F, Command, Control and Communication; 62204F, Aerospace Avionics; and 63728F, Advanced Computer Technology. Air Force thrusts generally transition into this program from 63728F and are coordinated through technical reviews at the staff and engineering levels. Coordination with other Services is done in the Research and Development Technology Panel of the Management Steering Committee for Embedded Computer Resources, in The DOD Computer Security Consortium, and in annual DOD apportionment reviews.

6. (U) WORK PERFORMED BY: The Electronics Systems Division (ESD) Hanscom AFB, MA has management responsibilities for the program. Contractors include the System Development Corporation, Santa Monica, CA; TRW, Redondo Beach, CA; Denver Research Institute, Denver, CO; System Architecture Inc., Randolph, MA; Softech Inc., Dayton, OH; Hughes Aircraft Company, Fullerton, CA; Systems & Applied Science Corporation, Riverdale, MD; Aerospace Corporation, Los Angeles, CA; DigiComp Research, Ithaca, NY; Dynamics Research, Wilmington, MA. System engineering support is being provided by MITRE Corporation, Bedford, MA.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 84:

A. (U) Project 2239 Computer Security Technology: Provides a technology transfer program; fosters wide-spread availability for multi-level computer security technology and validation techniques to industry and for Air Force and Department of Defense systems. The work responds to the Department of Defense Computer Security Initiative Task in four areas: (1) ad hoc program office support; (2) "trusted" (provable) system development and demonstration; (3) verification procedure; and (4) Air Force Computer Security Program Office applications. This work has wide-spread application. Among Air Force program offices with computer security requirements are Strategic Air Command Digital Information Network (SACDIN), Operational Application of Special Intelligence Systems (OASIS), WWMCCS Information System (WIS), Space Defense Operation Center (SPADOC), SEEK SCORE, IASA, EIFEL II, and MX. During FY 82 this project developed and demonstrated a multi-level computer security operating system, the Kernelized Virtual Machine/370; supported the Korean Air Intelligence System Program (KAIS), specifying and developing a "security interface" for command post operations; and refined and improved tools and mathematical languages used to verify multi-level security in computer systems. In FY 83 and 84 this project will continue development of trusted computer systems, complete the KAIS, and develop guidelines for incorporating security measures in weapon system embedded computers. These critically important efforts represent a continuing commitment to research and development of trusted computer systems as an integral part of military security.

B. (U) Project 2522 Requirements Analysis: This project develops and applies tools that provide the system developer rapid insight into the cost/schedule/performance implications of stated system requirements. These tools are used to identify costs and risk areas, structure and control changing requirements, and examine alternatives before making hardware, software, and financial commitments. During FY 82 the Automated Interactive Simulation Modeling System (AISIM), which provides an "easy to learn, simple to use" method for exploring requirements options, was rehosted on a government-owned computer. It was also installed at both Electronic System Division (ESD) and Space Division as a program office tool for assessing risk, cost effectiveness and feasibility of system designs. This project also developed initial User-System Interface (USI) guidelines which have been applied to the World Wide Military Command and Control (WWMCCS) Information System, SPADOC and OASIS programs. In FY 83 and 84 a new effort will begin to develop a Database Design and Evaluation Workbench (DDEW); AISIM will continue to be enhanced with increased applications planned for FY 84; and the USI efforts will also be expanded with the development of a USI supplement to the AFSC Design Handbook on Human Factors Engineering.

C. (U) Project 2523 Management Control Technology: Develops and applies information system tools and techniques to improve the planned and controlling of system acquisitions with embedded computer resources. This project develops and evaluates ways to estimate computer system timing and sizing. It applies software quality metrics as an approach to quantify software quality in defense systems. A recent effort examined eleven (11) software quality factors developed by a major defense contractor. As a result a force volume handbook on applying software quality metrics was published and distributed during FY 82. These will now be applied to an actual system acquisition. Management control and visibility will be enhanced through these quality "yardsticks." This project also responds to a Joint Logistics Commanders request to reduce the confusion resulting from diverse standards for software acquisition. Toward this end this project, during FY 83, will produce a MIL-STD-XXX on Software Engineering for tri-service use while completing updates to MIL-STDs-483, 490, and 1521A. Lastly, in an effort to collect and analyze data on software development costs, the Software Acquisition Resource Expenditure (SARE) collection system will be piloted in the Tactical Communications Control Facility Program starting in FY 83 and continue through FY 84.

D. (U) Project 2524 Policy and Procedure Guidance: This project develops comprehensive, specific guidance and procedures for the acquisition and support of computer resources. It also develops guidebooks, training media, and the Training and Performance Support System (TPSS) to train USAF personnel in software acquisition management. To reduce our estimated 30% shortfall in skilled computer system acquisition managers, the TPSS effort develops course materials, techniques and programs to provide the latest training in software acquisition. Already, over 120 people have been training at the prototype TPSS and are making positive contributions in their acquisition management duties. Preliminary courseware modules have been completed with additional lesson modules still being developed. During FY 83, additional printed guides, lesson outlines and automated acquisition management aids will be developed and refined for TPSS. Initial Operating Capabiltiy for TPSS is expected at ESD in early FY 84. TPSS and its products will be incrementally transferred to other Air Force Systems Command (AFSC) Product Divisions and Air Force Logistics Command (AFLC) Air Logistics Centers starting in FY 84. Finally, guidebooks in the areas of contract administration of embedded computer resources, and flight critical and fault tolerant software acquisition will be started during FY 84.

E. (U) Project 2526 Software Engineering Tools and Methods: Develops and applies a comprehensive, integrated set of engineering tools to improve the software development and acquisition processes. Special emphasis is on configuration management, documentation, training, and support to transfer the new tools to program offices. This project supports the National Software Works, and Ada, the new DOD standard Higher Order Language System. The National Software work demonstrates the internetting of computers and tools to support developers, maintainers, and users of computer systems. During FY 82 hardware was procured and installed at three Air Logistics Centers as part of a technology demonstration. This demonstration will be completed and evaluated during FY 83 with the resulting hardware and software transferred to AFLC in FY 83 and 84. Efforts are underway and will continue to bring Ada into operational use. Emphasis will be on investigating its impact on software productivity, design and reusability, as well as demonstrating its applicability to embedded computers. A prototype application of Ada will be conducted during FY 83 and 84 in a real world missile environment. This project will also develop a capabiltiy to train support equipment engineers in the use of the ATLAS test language.

F. (U) Project 2652 Computer Architecture Standards: Supports development of tactical command, control and communication and space systems by stabilizing the software development enviroment, using high order languages, and facilitating interoperability. Work has centered around efforts to support the MIL-STD-1750A and MIL-STD-1862A (NEBULA) Control Boards. Specifically, tasks to examine support software and evaluate the applicability of standard instruction set architectures (ISA) to operational environments has been accomplished. This project also provides educational materials and briefings on DOD and Air Force standardization efforts and examines Air Force support tools needed for these standards The work is in concert with recent DOD initiatives on standardization within the military to reduce the proliferation of computer architectures, improve supportability, and reduce costs. Funding was eliminated by Congress for this project to preclude new starts involving MIL-STD-1750A ISA in FY 83 pending completion of a Congressionally requested new DoD investigation of the ISA standardization program. In FY 84 this project will continue to support program office application of MIL-STD-1750A and will continue the MIL-STD 1862A work with an initial application demonstration.

G. (U) Project XXXX Logistics Information Management Support System (LIMSS): The LIMSS project is a development initiative to link together existing and planned logistics and enginee ring systems into a total logistics architecture. LIMSS will be accomplished through a long-term development program. The program will provide a standard architecture and a logistics command, control, and communications infrastructure that will network various forms of information processing via telecommunications for all logistics levels. We do not have a program that tracks these individual systems and links them via a total integrating architecture. As a result, we have duplicative systems that do not integrate or connect to each other, and we are not obtaining maximum benefit from our systems. The development process for LIMSS will include establishing a System Program Office (SPO) to develop a data dictionary of existing and planned systems through a baselining effort. This data dictionary which will include the names of the systems, what their function is, what information they process, and how that system would fit into a total architecture will begin in FY 83 and be completed in FY 84. In addition, the SPO will be tasked to develop information networking systems for various elements of logistic located in SAC, TAC, MAC, USAFE, PACAF, AFLC, and ATC. The initial system will be to integrate all of the logistics functions at a SAC base, installing the hardware, developing the software, and managing the base-level architecture to link supply, maintenance, transportation, civil engineering, logistics plans, and procurement. This will be done in FY 84 and 85 and will become the pilot program for like systems at all Air Force bases. This is a new-start project.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64742F
DOD Mission Area: #374, Multimission, Technology & Support

Title: Precision Location Strike Systems
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECTED LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	79,490	78,727	69,724	69,127		N/A
1190	Precision Location Strike System (PLSS)	78,890	78,127	69,724	69,127		N/A
1949	Advanced Location Strike System (ALSS)	600	600	0	0	0	N/A

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: A key element in carrying out the missions of close air support, interdiction and air superiority is suppressing the extensive and layered enemy threat radars and surface-to-air missiles. The Precision Location Strike System (PLSS) is critical to defense suppression efforts. PLSS is a tactical Air Force system designed to accurately locate enemy air defense emitters and destroy them in near-real time with a . It is the only system in being or in development with the rate of attack and certainty of kill necessary to significantly reduce the attrition of friendly air forces in Europe. Knowing the location of threat emitters is fundamental to developing electronic combat strategy and tactics for countering and defeating them. Once emitters have been located they can be destroyed, jammed or avoided. PLSS contributes to all three tactics and provides the overall coherence to the effective use of all defense suppression assets. It can attack and destroy priority emitters using standoff weapons or other munitions carried by PLSS guided F-16s. It will enhance the effectivenss of the F-4G/Wild Weasel/HARM and jammers such as the EF-111 by cueing them to the targets.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	87,795	98,859	80,379	-	105,142	584,775
Aircraft Procurement (PE 27244F)	1,700	1,800	6,400	-	176,100	186,000

(U) FY 82 RDT&E reductions reflect $6.9 million transferred to the Conventional Standoff Weapon and $1.4 million removed in budget adjustments for higher priority requirements. FY 83 RDT&E reductions reflect a $20 million cut by Congress to separate the strike mission from the location mission in the PLSS line. FY 84 RDT&E reductions reflect that $8.5 million was transferred to the F-16 line to continue development of the PLSS Vehicle Navigation Subsystem (VNS) and $2.1 million was deleted for a general reduction and deflation adjustments.

Program Element: #64742F
DOD Mission Area: #374, Multimission, Technology & Support

Title: Precision Location Strike Systems
Budget Activity: Tactical Programs, #4

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)[1]

Project 1190	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Estimated Cost
Aircraft Procurement	1,700	1,800	0	80,200		N/A
Procurement (Other)	0	0	0	62,650		N/A
Operations and Maintenance	100	100	300	9,004	CONT	N/A
Military Construction				7,900	3,800	

1/ Funds shown are in Program Element 27244F, Location Strike System and are for procurement of one complete PLSS system for the US Air Forces in Europe and upgrade of the development system to an operational status for training and contingency deployment.

5. (U) RELATED ACTIVITIES: The PLSS Weapon Navigation Subsystem (WNS), used to guide a variety of standoff weapons, will be developed under the Conventional Standoff Weapon (CSW), PE 64606F. The CSW has been combined with the Army's Corps Support Weapon System (CSWS) into a joint Army/Air Force program now called the Joint Tactical Missile (JTACMS). With submunitions as payload this missile will provide an effective long range standoff weapon for defense suppression and interdiction roles. PLSS is included in the current OSD initiative to establish a combined Interdiction Program. The PLSS airborne relay vehicles (TR-1) will be procured under PE 27215F, TR-1 Squadrons. Interoperable Data Link (IDL) equipment for PLSS (both ground stations and airborne sets) will also be procured under the TR-1 line. F-16 aircraft capable of carrying and employing the PLSS guidance equipment will be produced under PE 27133F, F-16 Squadrons. The development of the PLSS Vehicle Navigation Subsystem (VNS), used for aircraft positioning and targeting, will be transferred from the PLSS line to the F-16 line (Project 2907) in FY 84. An emitter identification effort has Army and Navy participation through sharing of technology, equipment and test information. Demonstration of the Emitter Location capability (formerly Project 1947 of PLSS) was a joint Air Force/Army/Defense Advanced Research Project Agency (DARPA) effort associated with Battlefield Exploitation and Target Acquisition (BETA) now incorporated in the Joint Tactical Fusion Program. Both of these efforts are being considered as preplanned product improvement for PLSS. Congress has directed that PLSS be put in the Tactical Cryptologic Program where it can be integrated with other tactical electronic reconnaissance systems. The Air Force is proceeding to implement this direction. As part of this transition, the Air Force plans to initiate a study in FY 84 to determine the most appropriate approach for enhancing the tactical intelligence utility of PLSS in conjunction with other systems.

6. (U) WORK PERFORMED BY: Overall management of this program element is by Air Force Systems Command, Aeronautical Systems Division, Wright-Patterson AFB, OH. PLSS Interoperable Data Link and TR-1 work is contracted through Air Force Logistics Command Detachment 8, 2762 Logistics Squadron Special. The Precision Location Strike System (PLSS) prime contractor with total system integration responsibility is Lockheed Missiles and Space Company (LMSC), Sunnyvale, CA. Major subcontractors include E-Systems Inc., Garland, TX (Intercept equipment); Harris Corp., Melbourne, FL, (DME Data Link); Control Data Corp., Minneapolis, MN (Digital Processing Equipment); Collins, Dallas, TX (Ground Communications

Equipment); IBM, Owego, NY (Signal Processing Equipment); Brunswick, Marion, VA (shelters); and Motorola Corporation, Phoenix, AZ (displays). Associate contractors include General Dynamics, Ft Worth, TX (F-16); Sperry Univac, Salt Lake City, UT (Interoperable Data Link); and Lockheed CA (LAC), Burbank, CA (TR-1 equipment). SofTech Corporation, Dayton, OH, provides independent validation and verification of the LMSC developed PLSS software. MIT Lincoln Laboratory, Lexington, MA and Aerospace Corporation, Los Angeles, CA perform studies and provide consultive services. Technical cognizance of the Emitter Location System is performed by the Rome Air Development Center (RADC), Rome, NY with International Business Machines (IBM), Owego, NY, as the development contractor.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: 1190 Precision Location Strike System

A. (U) Project Description: The PLSS project is the major development effort in this Program Element. PLSS will provide targeting-accuracy, integrated location and strike of hostile air defenses continuously in near real time and all weather over a theater-wide area. PLSS is the foundation of the electronic combat force structure and provides lethal defense suppression to reduce attrition of penetrating attack aircraft. PLSS will provide up to the minute Electronic Order of Battle information enabling the commander to assess the immediate threat to his strike force.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Contractor teams were reestablished following full funding in the FY 1981 Supplemental Appropriation. Contract negotiations were completed for the restructured program. Subsystem detail design, hardware procurement, fabrication, assembly and test continued. The first two of four software design releases occurred. Flight test of the TR-1 PLSS nose proved the structural and aerodynamic design sufficiency. Vehicle Navigation Subsystem development and F-16 integration were started.

(2) (U) FY 1983 Program: Vehicle Navigation Subsystem development continued through Preliminary Design Review when Congressional direction was received to separate the strike mission portion from the PLSS line. The VNS effort is being brought to an orderly conclusion in the PLSS line. It will be transferred to the F-16 line and continued in FY 1984. About $7 million had already been spent prior to the $20 million cut so some effort in the basic location mission portion has to be deferred into FY 1984. The location mission system Critical Design Review (CDR) will be conducted . PLSS subsystem fabrication will be completed. Qualification and acceptance of completed units will occur. Software development will be completed. Independent software validation and verification will continue. PLSS subcontractor unit fabrication and delivery will be completed for system integration, testing and checkout. Test aircraft modification will occur. Integration of the full PLSS location mission system will occur and contractor system level testing will start. The Advanced Location Strike System (ALSS) will be phased out in FY 1983. Planning for Air Force testing will be completed. Preparation, manning and training for Air Force testing is underway. Logistics support equipment development deferred during the program restructure will be continued.

Program Element: #64742F
DOD Mission Area: #374, Multimission, Technology & Support

Title: Precision Location Strike Systems
Budget Activity: #4, Tactical Programs

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Contractor system integration and flight testing of the system will be completed. Procurement of Development Test and Evaluation/Initial Operational Test and Evaluation (DT&E/IOT&E) items will be completed. Air Force DT&E/IOT&E will begin. Contractor logistics support will be required. Logistics support equipment development will be continued. Cost estimates are based on negotiated contract prices and an Air Force Systems Command, Aeronautical Systems Division comptroller Annual Cost Estimate and on system program office estimates; however, the Annual Cost Estimate final results were not complete in time to be totally incorporated in this budget. After eight years in full scale development and as a result of the many technical and program reviews, the system design is mature and can be expected to perform as advertised. Enhancements to improve the tactical intelligence utility of the system will be explored. An Air Force Systems Acquisition Review Council review for full location mission system procurement and deployment will be accomplished. Long lead procurement for Interoperable Data Link equipment associated with the TR-1 will be initiated. Strike mission efforts will be continued in the appropriate weapon and aircraft lines.

(4) (U) Program to Completion: Air Force DT&E and IOT&E will be completed. Deficiencies found during testing will be corrected. Logistics development and procurement will continue. First unit training and provisioning will occur. The production system will be deployed. Location mission Initial Operational Capability will be accomplished. Contractor support will continue until the Software Development Laboratory is delivered to the Air Force. Air Force Follow-on Operational Test and Evaluation will begin. Preplanned product improvements will be considered. Tactical intelligence improvements will continue. The RDT&E system will be refurbished and used for training and contingency deployment. Separate IOCs will occur for each strike mission weapon and aircrft.

C. Major Milestones:

Milestones	Date
(1) (U) Area Coordinating Paper Number 4	Mar 1972
(2) (U) Tactical Air Forces Required Operational Capability (TAF ROC) 314-74 Validated	Nov 1974
(3) (U) ALSS - Deployment to Europe	May 1975
(4) (U) PLSS Defense System Acquisition Review Council (DSARC) II/Milestone II	Jul 1977
(5) (U) Initiate PLSS Location Mission DT&E/IOT&E	May 1984
(6) (U) Air Force Systems Acquisition Review Council (AFSARC) III/Milestone III	FY 1985
(7) (U) Complete DT&E/IOT&E	May 1985
(8) PLSS Location Mission Initial Operational Capability	[illegible]

Budget Activity: Tactical Programs, #4
Program Element: #64742F Precision Location Strike System (PLSS)

Test and Evaluation Data

1. (U) Development Test and Evaluation: Combined DT&E/IOT&E is scheduled to begin in May 1984. Detailed test planning should be completed in the spring of 1984. No Air Force Dt&E has been conducted to date.

(U) Contractor development testing accomplished to date consists of brassboard and actual hardware tests. This includes TR-1 mission avionics, F-16 antenna designs, Site Navigation Subystem and Central Processing Subsystem data processing equipment and shelters. Two of four planned software tests are complete. Contractor TR-1 flight testing of PLSS peculiar aerodynamic modifications and environmental testing of mission avionics are complete.

Precision Location Strike System mission and description: Tactical Air Forces Required Operational Capability No. 314-74, Location Strike System, 1 May 74, outlined the requirement for detection, identification, location, and strike of pulsed and nonpulsed emitters. It also stated the requirement for a capability to strike radiating and non-radiating targets in all weather conditions. The Precision Location Strike System will provide the tactical forces with an integrated location/strike system capable of near-real-time location and attack of hostile air defense emitters. It is the only system with the rate of attack and certainty of kill necessary to significantly reduce the attrition of friendly aircraft in the European theater. It will provide an update of the enemy electronic order of battle and accurate location of the threat emitters. This will be the foundation for the tactical electronic combat strategy to destroy, degrade or avoid the threat. PLSS will initially direct standoff weapons to destroy priority threats. As the threat is reduced, PLSS will provide information to allow strike aircraft to avoid new threats and can guide strike aircraft to targets for direct attack using cost-effective munitions. The system is capable of attacks against tactical targets (such as headquarters, command and control facilities, airfields, and bridges) located by other systems. It also provides near-real-time integrated detection, location and destruction of the enemy's defense system in a dense emitter and jammer environment. The Precision Location Strike System will be able to locate and destroy enemy operating in the PLSS frequency coverage and to operate in conjunction with other signal intelligence and reconnaissance systems to provide cueing and direct strikes for those systems. Electromagnetic emitter information collected by a triad of aircraft will be data linked to a ground Central Processing Subsystem for processing and evaluation. The target information will be forwarded to appropriate combat control elements which will direct tactical strike aircraft to the target area. The Central Processing System will control standoff PLSS-guided weapons and provide target and navigation data to the strike aircraft. Possible follow-on applications include distance measuring equipment guidance of cruise weapons and the acquisition of targeting data for Army surface-to-surface missiles and artillery.

2. (U) Operational Test and Evaluation: OT&E is scheduled to begin in May 1984 and be complete in May 1985. None has been conducted to date. Operational testing of the PLSS will be accomplished as a combined development test and evaluation and initial operational test and evaluation (DT&E/IOT&E). The purpose of the IOT&E is to determine the operational effectiveness and suitability of the PLSS when employed in its operational configuration and environment. The test and evaluation program will be fully integrated to minimize test duplication. The Air Force Test and Evaluation Center (AFTEC) will direct the IOT&E, using a team of trained Air Force operations and maintenance personnel and resources from the Tactical Air Command (TAC), Electronic Systems Command (ESC), Air Force Logistics Command (AFLC), Strategic Air Command (SAC), and the Air Training Command (ATC).

Budget Activity: Tactical Programs, #4
Program Element: #64742F Precision Location Strike System (PLSS)

(U) TR-1 aircraft will fly from Beale AFB, California with the ground station located at Nellis AFB, Nevada. The test will be conducted on the US Air Force Tactical Fighter Weapons Center Range Facility in Nevada. This will allow use of the electromagnetic emitter environment of the Nellis and Naval Weapons Center (NWC), China Lake, California ranges.

(U) Operational scenarios are being established to evaluate the ability of the system to identify and locate electronic emitters and provide this information to appropriate command, control and communications intelligence (C^3I) elements which will assign target objectives to attack aircraft. PLSS will direct the delivery of unguided ordnance against targets, including nonradiating targets whose location is provided by sources external to the PLSS. The F-16 will be used as the primary weapons delivery aircraft. Capability of PLSS to accurately direct and control multiple delivery aircraft will be evaluated. PLSS susceptibility to both friendly and enemy electronic countermeasurs (ECM) will be tested throughout the IOT&E effort with emphasis on ECM effects on location and strike capability. Vulnerability of the PLSS airborne and ground components will also be evaluation. Reliability, maintainability, availability, and logistics supportability of the ground facilities and airborne mission subsystems will be evaluation to the extent that support equipment will be available.

(U) OT&E reports published: None

3. System Characteristics: The following are goals for critical parameters to be evaluated during Development Test and Evaluation/Initial Operational Test and Evaluation.

Parameter	DCP Thresholds	Objectives (DCP Goals)	Demonstrated Performance
Probability of:			
Location			TBD
Identification			TBD
Frequency Coverage			TBD
Range			TBD
Accuracy (R/D=1)			
Strike			TBD
Location			TBD
System			TBD
Mission Completion Success Probability			TBD

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64750F Title: Intelligence Equipment
DOD Mission Area: #327 - TIARA for Tactical Air Warfare Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	14,624	12,869	15,403	15,671	Continuing	N/A
1174	Intelligence Security Equipment	2,588	2,600	1,200	1,000	Continuing	N/A
1955	Air Force Support to DOD Indications & Warning	6,128	6,369	9,403	10,250	Continuing	N/A
2053	Foreign Technology Division Intelligence Processes	3,080	3,900	4,800	4,421	Continuing	N/A
2165	COMPASS PREVIEW	988	0	0	0	0	20,648
2323	Radar Prediction System (RAPS)	535	0	0	0	0	5,667
2631	Computer Assisted Mission Planning System (CAMPS)	1,305	0	0	0	0	1,605

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This Program Element supports United States Air Force operating commands by performing the engineering development of ground equipment used to process, integrate, display and distribute intelligence data. This equipment will reduce the time required for the exploitation of intelligence data to meet the needs of Air Force agencies producing strategic, tactical, and scientific and technical intelligence. The equipment will also improve the efficiency of those units producing air target materials. Equipment and techniques are also developed to counter the foreign intelligence threat to the USAF mission, to support the collection of human intelligence, and to support the USAF escape and evasion mission.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	Additional to Completion	Total Estimated Costs
RDT&E	14,744	18,469	16,894	Continuing	N/A

(U) The decrease in funding in FY 1982 reflects the reprogramming of funds out of the PE to fund another higher priority program. The decrease in funding in FY 1983 reflects the deletion of funds from Project 2631, CAMPS, by Congress. The decrease in funding in FY 1984 is the net result of the deletion of funding for Project 2631, CAMPS, a share of congressionally directed undistributed RDT&E reductions, inflation adjustments, and the addition of funds to Project 1955, AF Support To DoD Indications and Warning. These additional funds will be used to accelerate development of major software upgrades to the Aerospace Defense Command Intelligence Data Handling System capability, in order to coincide with the Space Defense Operations Center (SPADOC) developments.

Program Element: #64750F | Title: Intelligence Equipment
DOD Mission Area: #327 - TIARA for Tactical Air Warfare | Budget Activity: #4 - Tactical Programs

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands) None

5. RELATED ACTIVITIES: Intelligence program activities of joint service interest such as the Indications and Warning efforts are coordinated with the Defense Intelligence Agency. Exploratory and advanced development activities related to this program are conducted under Program Element 62702F, Command, Control, and Communications and 63789F, Command, Control, and Communications Advanced Development. Funding for the development of the being developed in Project 1174 is in Program Element 63431F, Space Communications. Other related Air Force activities include Program Elements 31011G, Cryptologic Activities; 31328F, Strategic Air Command; 31310F, Foreign Technology Division; 31334F, Air Force Other Commands; 31335F, Air Force Automated Data Processing Support to General Defense Intelligence Program; 31318F, HUMINT (Controlled); 31321F, HUMINT (Overt); 91212F, Air Force Intelligence Services; 35127F, Foreign Counterintelligence; 35128F, Security and Investigative Activities; rd 27431F, Tactical Air Intelligence System Activities.

6. (U) WORK PERFORMED BY: The Air Force manager for all the projects remaining in the Program Element in FY 1984 is the Rome Air Development Center, Griffiss AFB, NY. Major contractors are (Project 1955) Planning Research Corporation, McLean, VA; International Computing Company, McLean, VA; Pattern Analysis and Recognition Corporation, New Hartford, NY; (Project 2053) CORVUS, Vienna, VA; and (Project 1174) Rockwell International, Anaheim, CA. In addition, there are currently fourteen other contractors with a total contract value of $8,175 thousands.

7. PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project 1174 - Intelligence Security Equipment: Develops equipment and techniques to counter foreign surveillance threats. The project also develops unique equipment and techniques to support the Air Force mission for collection of foreign intelligence through the use of human resources and to support the intelligence aspects of prisoner of war escape and evasion. In FY 1982, completed development of a small two-color infrared imaging system, a range-gated television system, and a and initiated development of a miniaturized two-way radio communications system, an automated special printing system and a miniature multiplex microwave link and the study and design of techniques for passive signalling and communicating. The latter three efforts will be completed in FY 1983, the miniature addressable transceiver system effort will be continued, and four new efforts will be initiated: evaluation of techniques for a portable wide-band countermeasures receiver, a portable direction finding system and and development of an Those efforts initiated in FY 1983 will be completed in FY 1984, while the focus of the miniature addressable transceiver system effort will focus on development of the

B. Project 1955 - Air Force Support to DoD Indications and Warning: Improves the existing capability by modernizing the Air Force Indications and Warning Centers at Strategic Air Command, Aerospace Defense Command, Military Airlift Command, and Alaskan Air Command to provide compatibility with the National Military Intelligence Center modernization effort. Provides a capability to rapidly correlate available all-source intelligence data, and develop indication and warning of threats to assist the National Command Authorities and military commanders in managing a crisis situation.

Previous and planned activities during FY 1982 and FY 1983 include: (1) At Strategic Air Command, complete initial expansion of Operational Intelligence Support System (OISS) capability which provides improved analyst terminal support, text product generation, and external data access. Completes other developments to provide I&W analysts selective access to other SAC intelligence data base systems, begins development of interfaces for the DoD Intelligence Information System (DODIIS), and initiates actions to address requirements for the Intelligence Operations Center (IOC) for the 1985-1990 timeframe; (2) At Aerospace Defense Command, space/missile indicator development will become operational and development of foreign launch assessment capability will continue; (3) At Military Airlift Command, a functional description outlining ADP support requirements for I&W was completed and an architecture will be developed and a cost analysis will be completed, and; (4) At Alaskan Air Command, a small scale, stand alone I&W support system will become operational. Activities planned for FY 1984 include: (1) At SAC, complete design for upgrade of the IOC, continue efforts to provide analysts selective access to other SAC intelligence data base systems, and begin integration of DODIIS interface and indicator support system; (2) At ADCOM, continue to implement foreign launch assessment capability, and initiate development of major software upgrades for the Intelligence Data Handling System to coincide with the Space Defense Operations Center (SPADOC) developments, and; (3) At MAC, complete development of an I&W oriented data base and begin implementation of collection management capability and airfield threat analysis capability.

C. Project 2053 - Foreign Technology Division Intelligence Processes: Improves the Foreign Technology Division capability to acquire, evaluate, analyze, and report on foreign scientific and technical information and material. These improvements will assist in responding to intelligence requirements vital to the operational commanders, research and development planners, and national level agencies. Efforts completed in FY 1982 or planned for accomplishment in FY 1983 include: completion of techniques for forecasting missile developments, including methods of evaluating engine performance and maneuverable reentry vehicle design; aerodynamic vehicle propulsion and missile guidance subsystem analysis capability, and; hardware analysis and resource study to provide an architecture for integrating existing and planned FTD ADP systems. Space system forecasting capability was implemented and five new efforts will be initiated: algorithms for analysis of data from the Real Time Optical System (RTOS); wideband imaging radar processing capability; foreign Electronic Support Measures (ESM) analysis methodology; development of a standard query language for use by the FTD analysts, and; ballistic missile guidance and guidance related error analysis. Finally, construction of a special C^3 antenna has begun and operation will begin in FY 1983. In FY 1984, planned work includes: completion of the operation and analysis of the special C^3 antenna and development of the standard query language, based on results of a feasibility study to be completed in FY 1983; continution of the other four previously initiated efforts, and; initiation of development of solid rocket motor simulation and air launched missile modeling capability, and automation of infrared/electro-optical imagery exploitation capability.

D. (U) Project 2165 - COMPASS PREVIEW: Developed a test-bed digital imagery exploitation device for Air Force softcopy conceptual validation testing. All RDT&E activities were completed in FY 1982. The COMPASS PREVIEW system will be operated by SAC as an Interim Operational Capability and then will be removed from the SAC facility.

E. (U) Project 2323 - Radar Prediction System (RAPS): Developed an automated system that produced a prediction of a radar scope display of specific geographic areas. This radar prediction was generated from a digital data base and was primarily to support the aircraft crew members in mission planning for strike, reconnaissance or air drop delivery. This project was cancelled in early FY 1982 due to lack of user interest in production and cost escalation in the development and test program.

Program Element: #64750F
DOD Mission Area: #327 - TIARA for Tactical Air Warfare

Title: Intelligence Equipment
Budget Activity: #4 - Tactical Programs

F. (U) Project 2631 - Computer Assisted Mission Planning System (CAMPS): Was to develop a capability to provide aircrews an automated mission planning capability to assist in route planning, computation of required fuel loads, performance of penetration analysis to best avoid enemy defenses, and accomplishment of weapons delivery planning. Four testbeds were fielded at squadron level through FY 1982 and provided the inputs needed to develop a functional description and draft specifications for the full scale development program. This project was terminated in FY 1983, based on the deletion of all funding by Congress.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64753F   Title: Combat Helicopter Modernization
DOD Mission Area: #225 - Air Warfare Support   Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	18,829	27,347	66,587	17,877	7,857	138,497

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Modernization of the Aerospace Rescue and Recovery Service and the Special Operations Force must begin at once to replace obsolescent, hard-to-maintain equipment and to upgrade helicopter capabilities to cope with increasing threats. The objective of this program is to develop a derivative of the Army UH-60A Black Hawk helicopter to meet Air Force combat rescue and special operations mission requirements. The Air Force will integrate improved avionics, extended range capability, more powerful engines and necessary mission equipment into the H-60, a helicopter with proven reliability, maintainability, and combat/crash survivability.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total
RDT&E	18,829	32,347	17,977		20,913	90,066
Procurement (Aircraft)*						
Program Element #35113F			62,100		TO BE DETERMINED	
(Quantity)			(4)			
Program Element #27241F			1,400		TO BE DETERMINED	
(Quantity)			(0)			

*Includes Initial Spares

(a) Increased RDT&E funding in FY 1984 and beyond is due to program repricing prior to Full Scale Development (FSD) contract award using more refined estimating techniques. Initial program cost estimates were based on the best information available at the time -- primarily from parametrics and a limited amount of Army data. Current estimates are based on negotiated contracts and extensive Army and Navy experience with the H-60 airframe.

(b) Reduced procurement funding in FY 1984 reflects the decision to defer initial production to FY 1985 to help offset increased estimated procurement cost following the above-mentioned program repricing.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Procurement (Aircraft)*						
Program Element #35113F			25,900**	221,400	4,026,800	4,274,100
(Quantity)			(0)	(7)	(207)	(214)
Program Element #27241F				6,700**	570,300	577,000
(Quantity)				(0)	(29)	(29)

*Includes Initial Spares
**Advance Buy

5. (U) RELATED ACTIVITIES: Not applicable.

6. (U) WORK PERFORMED BY: The Air Force management of the HH-60D is accomplished by the Air Force Systems Command Aeronautical Systems Division, Wright Patterson Air Force Base, Ohio. The Full Scale Development contract for avionics systems integration was awarded to an International Business Machines (Owego, New York)/Sperry Flight Systems (Albuquerque New Mexico)/E-Systems (Greenville, Texas) team in October 1982. The Full Scale Development contract for airframe modifications was awarded to Sikorsky Aircraft Division of United Technologies (Stratford, Connecticut) in November 1982.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable.

8. (U) SINGLE PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: (Not Applicable)

A. (U) Project Description: Not Applicable.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Not Applicable. FSD contract signed first quarter FY 1983.

Program Element: #64753F | Title: Combat Helicopter Modernization
DOD Mission Area: #225 - Air Warfare Support | Budget Activity: # 4 - Tactical Programs

(2) (U) FY 1983 Program: Planned accomplishments for the HH-60D include preliminary design review (PDR) for both the avionics subsystems and the modified airframe. The critical design review for the modified airframe is also planned. Actual airframe modification will commence.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The planned HH-60D program for FY 84 includes critical design review of the avionics subsystem, ground testing of the modified airframe (wind tunnel jettison, auxiliary tank fuel, pressure refueling, static limit load testing, component qualification and fatigue life evaluation), and avionics subsystem integration testing. First flight of the modified airframe (less avionics) is scheduled with initial shakedown and airspeed calibration tests being conducted. Airframe developmental testing will commence with fifty percent scheduled for completion in FY 1984. The first avionics subsystem will be installed as an integrated set into the modified airframe.

For both the development and production phases of the program, detailed and parametric cost estimating methods were used. For the airframe and engine, actual costs for analagous systems (Army Black Hawk and Navy Seahawk) were available. For the Avionics development phase and the avionics on the first 22 production helicopters, a firm contractor's proposal with detailed prices and backup was on-hand. For the avionics for the remaining production program, a contractor's budgetary estimate was available.

(4) (U) Program to Completion: The first fully modified HH-60D will be entered into the developmental/initial operational test program. The second modified airframe will have its avionics suite installed and will join the test program. Initial production start-up is scheduled. The Physical Configuration Audit will occur on aircraft number 4 by the end of FY 86. After achieving Initial Operational Capability (early FY 87), an Operational Readiness Demonstration will be conducted. With a favorable AFSARC III decision in FY 86, full-rate production of HH-60D will be initiated.

C. (U) Major Milestones:

Milestones		Dates
A. MAC/TAF requirements validation		September 1979
B. AFMENS Approval		November 1980
C. AFSARC Review		July 1982
D. Full Scale Development Contract Award:		
Avionics Integration		October 1982
Airframe Modification		November 1982
E. Flight Test Begins	*(FY 1983)	FY 1984
F. AFSARC II (Limited Production Decision)	*(FY 1982)	FY 1984
G. Initial Production Begins	*(FY 1984)	FY 1985
H. Major Production Decision (AFSARC III)	*(FY 1985)	FY 1986
I. Initial Operational Capability	*(FY 1986)	FY 1987

*Date presented in Fiscal Year 1983 Descriptive Summary

Program Element: #64753F
DOD Mission Area: #225 - Air Warfare Support

Title: Combat Helicopter Modernization
Budget Activity: #4 - Tactical Programs

(U) EXPLANATION OF MILESTONE CHANGES

E. Delay in flight testing results from overall program slip caused by delay in contract award.

F. An AFSARC Review was held prior to contract award and the decision made to defer AFSARC II until completion of the Critical Design Review in FY 1984.

G. Initial production deferred to FY 1985 to help offset increased estimated program cost after re-pricing.

H. Same as E.

I. Initial Operational Capability delayed to FY 1987 by the deferral of initial production to FY 1985 (Milestone G).

Budget Activity: Tactical Programs, #4
Program Element: #64753F, HH-60D Program

Test and Evaluation Data

1. (U) Developmental Test and Evaluation:

(U) Combined Developmental Test and Evaluation (DT&E) and Initial Operational Test and Evaluation (IOT&E) will be conducted by a combined task force as described in the 3 August 1981 HH-60D Test and Evaluation Master Plan. DT&E/IOT&E will be conducted on two modified UH-60A helicopters. The first aircraft will initially have only airframe modifications and will be used primarily for aerodynamics, mechanics, and fuel system testing. The second aircraft will include both airframe and avionics modifications and will be used for avionics system testing. Once airframe testing on the first aircraft is completed, it will be modified with the full avionics suite and will participate with the second aircraft in avionics testing. The DT&E/IOT&E and production aircraft will be similarly configured.

(U) The primary objectives of DT&E are to assist in the engineering design and development process, to verify accomplishment of specification requirements, to characterize the performance of the system, and to ensure that critical issues have been sufficiently resolved to permit a major production decision at Milestone III.

(U) The US Army Aviation Research and Development Command (AVRADCOM) has accomplished a significant amount of DT&E on the UH-60A airframe. The US Naval Air Systems Command has accomplished extensive DT&E on a derivative of the UH-60A (the SH-60B Seahawk) which will provide the engines, transmission, automatic flight control system and rescue hoist planned for the HH-60D. Data from these tests applicable to the HH-60D airframe and systems will be used to the greatest extent practical to reduce HH-60D testing requirements.

(U) Contractor DT&E will be conducted at the Sikorsky Aircraft Company and at the selected avionics contractor facility beginning in the Spring of 1983. The first flight is scheduled for the Spring of 1984. As soon as practical, the test aircraft will be transferred first to Edwards Air Force Base California and finally to Kirtland Air Force Base New Mexico, the designated operational site for the combined Air Force DT&E/IOT&E which will continue until the planned major production decision in late 1985. Air Force DT&E will be conducted by the Air Force Flight Test Center. The service program manager is Lt Col Dick Kalishek.

(U) Data on Reliability, Maintainability, Availability and Logistics Supportability will be collected during flight testing using the Air Force Flight Test Center System Effectiveness Data System. Aircraft maintenance will initially be performed by contractor personnel with Air Force personnel participating through over-the-shoulder or realistic on-the-job training. Complete Air Force maintenance will be planned for the earliest possible date.

Budget Activity: Tactical Programs, #4
Program Element: #64753F, HH-60D Program

2. (U) Operational Test and Evaluation (OT&E).

(U) AFTEC will manage the initial operational test and evaluation (IOT&E) portion of the combined developmental test and evaluation (DT&E/IOT&E), dedicated IOT&E and Phase I follow-on OT&E (FOT&E) of the HH-60D.

(U) The IOT&E will address operational effectiveness and suitability objectives during and in support of DT&E/IOT&E flights. In addition, suitability evaluators will gather data throughout the entire DT&E/IOT&E test program. As the DT&E/IOT&E test program progresses, there will be an increasing emphasis on OT&E objectives. Of the 1000 hours in the test program, approximately 450 hours will be dedicated to IOT&E. Of these 450 hours, 200 hours will be used for training, 150 hours for simulated mission scenarios, and 100 hours for deployments to operational locations. IOT&E will begin in March 1984 and be completed in early 1986.

(U) The Phase I FOT&E will begin following AFSARC II and continue until delivery of the first production aircraft (approximately 1 year). This FOT&E will be used to evaluate correction of deficiencies identified during IOT&E, refine evaluations of operational effectiveness and suitability, evaluate tactics and techniques for combat rescue, and refine evaluations of aircrew and maintenance training requirements.

3. (U) Systems Characteristics:

Characteristic	Objective/Threshold	Demonstrated
Hover capability	Mid-mission hover out of ground effect at 4000 ft, 95°F	To be determined
Cruise speed	128 knots minimum at max continuous power	To be determined
Dash speed	145 knots minimum	To be determined
Unrefueled mission radius	Approximately 250 nautical miles	To be determined
Terrain following/Terrain Avoidance performance	Safe and effective flight at altitudes as low as 100 feet above the terrain	To be determined

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 64754F Title: Joint Tactical Information Distribution System (JTIDS)
DOD Mission Area: Tactical Communications, #343 Budget Activity: Tactical Programs, #4

1. (U) RESOURCFS (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	72,378	52,513	49,334	61,587	344,391	813,603

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The objective of this program is to develop a highly jam resistant, secure digital information distribution system for use in a tactical combat environment. The Joint Tactical Information Distribution System (JTIDS) is a joint development employing time division multiple access and spread spectrum techniques. The system will provide sufficient connectivity and capacity to permit rapid and secure exchange of the necessary command, control and status information among all equipped elements in the tactical theater.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	68,378[1]	52,513	37,951[2]		334,800	733,877[2]

1- FY 1982 reprogramming denied by Congress. Funds returned to JTIDS.
2- TADIL J message standard and F-15 integration development funding added.

4. (U) OTHER APPROPRIATION FUNDS: ($000)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Aircraft Procurement:						
E-3A [3]	6,900	16,300	19,800	17,200	19,700	125,000[4]
F-15				400	TBD	TBD
Other Procurement:						
Ground Terminal (PE 27434F)	26,484	25,284	23,267	29,624	18,341	123,035

3- Includes installation labor & spares
4- Increase from $88,100 due to addition of 12 aircraft.

Program Element: #64754F
DOD Mission Area: Tactical Communications, #343

Title: Joint Tactical Information Distribution System (JTIDS)
Budget Activity: Tactical Program, #4

5. (U) RELATED ACTIVITIES: The Joint Tactical Information Distribution System development is managed by a jointly manned program office. Development, prototype fabrication, and test of terminal equipments for various applications of the services will be funded under this program element and will be conducted in conjunction with the other programs with which the equipments will ultimately be integrated (E-3A - P.E. 27417, F-15 - P.E. 27130).

6. (U) WORK PERFORMED BY: The Joint Program Office is located at the Electronic Systems Division, Hanscom AFB, MA. Work is also being done at the Aeronautical Systems Division, Wright Patterson AFB, OH; and the Electromagnetic Compatibility Analysis Center, Annapolis, MD. Initial system design and fabrication of prototype terminals for the E-3A were under contract to Hughes Aircraft Company, Fullerton, CA, under a subcontract to the E-3A contractor, the Boeing Company, Seattle, WA. Hughes began delivery of production units of the Class 1 terminal for the E-3A and the surface interface facilities in June 1982 (one month early). A firm fixed-price contract was let to Singer-Kearfott, Little Falls, NJ, for full scale engineering development of the Class 2 terminal (Rockwell-Collins, Cedar Rapids, IA, is the second contractor in the leader-follower concept being pursued in this contract.). Other major contractors include: MITRE Corp, Bedford, MA, system engineering support; Singer-Kearfott, Little Falls, NJ, Advanced Development Model fighter class terminal; International Business Machines (IBM), Oswego, NY, surface terminal facility; McDonnell Douglas Aircraft Corp, St Louis, MO, fighter cockpit integration studies; and ARINC Research Corp, Annapolis, MD, design-to-cost studies.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

None

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: This is a one project program.

A. (U) Project Description: Currently, information upon which to base critical operational decisions normally exists somewhere within a combat area, but may not always be available to the force element needing the data. Consequently there is an urgent requirement for a system that will distribute essential information to all elements of the force. The system must secure the message traffic, work in a severe jamming environment, and prevent hostile forces from intercepting and using the transmitted information. The Joint Tactical Information Distribution System (JTIDS) satisfies these requirements.

The system will be structured to operate as an information distribution network into which tactical users transmit command and control, surveillance, position and status, or other significant combat information at specific time intervals. All of this information is immediately available to each net participant who may select for display or storage that portion of the information in which he is interested. The system will interconnect the E-3A aircraft; ground and shipboard command, control and surveillance centers; and combat and support aircraft.

Program Element: #64754F
DoD Mission Area: Tactical Communications, #343

TITLE: Joint Tactical Information Distribution System (JTIDS)
Budget Activity: Tactical Programs, #4

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Initiated development of depot support equipment for the E-3A terminal. Full scale development of the fighter terminal continued. Flight tests in pod-configured fighters were completed in January 1982.

(2) (U) FY 1983 Program: Continued development of depot support equipment for the E-3A terminal. Full scale development of the fighter terminal continued. Incorporation of the new joint service approved message standard was initiated.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Includes funds for the continued development of depot support equipment for the E-3A/ground terminal. Also includes funds for the continued full scale development of a fighter terminal and flight tests in F-15 fighter aircraft. The request is based on the January 1981 DSARC II milestone estimates and a fixed-price terminal development contract.

(4) (U) Program to Completion: Development of depot support equipment will be completed. Development of the fighter terminal and integration equipment will also be completed. (Note: The development of aircraft integration equipment, with the exception of installation wiring, has been delayed until after F-15 aircraft flight tests in 1984.) The first JTIDS-equipped F-15 will be operational in FY 1988.

C. (U) Milestones:

1.	Waveform Decision	Feb 1976
2.	Initial E-3A Prototype Delivery	Jun 1977
3.	Start Surface Terminal Development	Jun 1977
4.	Start E-3A (Class I) terminals low-rate initial production	Jul 1980
5.	Start Fighter Terminal Full Scale Development	Jan 1981
6.	Surface Terminal Production Decision	Dec 1981
7.	Initial E-3A Production Terminal Delivery	Jun 1982
8.	Fighter Terminal Production Decision	Jun 1985

Budget Activity: Tactical Programs, #4
Program Element: #64754F - Joint Tactical Information Distribution System

Test and Evaluation Data

1. (U) Development Test and Evaluation: The Joint Tactical Information Distribution System will develop a highly jam resistant, secure digital information distribution system for use in a tactical combat environment. This joint development effort, managed by the Air Force Systems Command Electronics Systems Division at Hanscom Air Force Base, Massachusetts is a merger of the earlier efforts of Air Force (SEEK BUS) and Navy development programs.

(U) The feasibility of Time Division Multiple Access was demonstrated during the March 1973 E-3A brassboard flight test. Future tests will occur throughout the development cycle of each class of terminal.

(U) An extensive flight and bench test program to demonstrate compatibility with air traffic control equipments operating in the same portion of the frequency spectrum has been completed. These tests, which were conducted under the auspices of the Office of Telecommunications Policy, Executive Office of the President, in conjunction with the Federal Aviation Administration, demonstrated that the Joint Tactical Information Distribution System can co-exist with the other systems in the band without harmful interference.

(U) Contractor flight tests of the Hughes Class 1 Advanced Development Model terminal on the E-3A aircraft evaluated net entry, synchronization, operation, and jamming margin. All specific operating parameters of the Class 1 terminal were met or exceeded in test programs in 1977 and 1978. Net management was assessed to be time consuming. Resolution of this problem is being addressed in net management studies and the development of a new net management time-slot assignment algorithm. Additional testing of the Class 1 full scale development model took place in September and October 1981.

(U) Additional testing in 1979 of the multipath propagation and doppler shift did not cause any adverse degradation with the Joint Tactical Information Distribution System in the full anti-jam mode. Performance specifications were met under jamming conditions.

(U) During development flight tests at Eglin Air Force Base from November 1979 through October 1980, the Class 1 terminal was interfaced with the existing Tactical Air Control System through the Adaptable Surface Interface Terminal. Functional performance was successful, but reliability of the Class 1 terminal was below expectations. Further testing of Class 1 terminal reliability was accomplished during the September-October 1981 tests. The reliability during these tests was improved, and overall suitability was rated satisfactory.

(U) Contractor acceptance testing of the Singer-Kearfott advanced development models of a Class 2 terminal were completed late in 1978. The Naval Air Development Center completed bench and flight testing of this terminal in September 1979. Some net management, relative navigation, anti-jam, and TACAN operations were deficient. Further testing was conducted during the pod-configured Class 2 Advanced Development Model tests from June 1981 to January 1982. The objective of packaging the functions in a fighter-sized terminal was successful.

(U) Electromagnetic Compatibility testing has begun in the United Kingdom and Germany to support frequency clearance in Europe.

2. (U) Operational Test and Evaluation: The purpose of Joint Tactical Information Distribution System (JTIDS) initial operational test and evaluation (IOT&E) is to evaluate the operational effectiveness and operational suitability of JTIDS terminals and the ability of the system to support both individual and joint service concepts in an operational environment. Testing of JTIDS has included multiservice (Army, Navy, Air Force, and Marine Corps) combined development test and evaluation (DT&E)/IOT&E and service-unique testing. The Air Force Test and Evaluation Center (AFTEC) conducts IOT&E for the Air Force and is the lead agency for multiservice IOT&E. The other service operational test and evaluation (OT&E) organizations involved in JTIDS testing are the United States Army Operational Test and Evaluation Agency (USAOTEA) the Navy Operational Test and Evaluation Force (OPTEVFOR), and the Marine Corps Operational Test and Evaluation Activity (MCOTEA). The Air Force and Army are developing JTIDS terminals based on a time division multiple access (TDMA) technology The Navy and Marine Corps are developing JTIDS terminals based on a distributed TDMA (DTDMA) technology. Operational test and evaluation of these two systems will be independent of each other with the exception of some limited interoperability testing in the mid to late 1980s.

(U) Test and Production Milestones:

E-3A JTIDS advanced development model (ADM) terminal DT&E/IOT&E	May-June 78
Adaptable Surface Interface Terminal (ASIT) full-scale development (FSD) terminal DT&E/IOT&E	Nov 79-Dec 80
E-3A/JTIDS low rate initial production	July 80
ASIT operational suitability evaluation	May-Dec 81
JTIDS Class 2 pod-configured ADM terminal IOT&E	Jun 81-Jan 82
US/NATO E-3A IOT&E	Sep-Oct 81
ASIT long-lead production decision	Dec 81
Class 2 (fighter) FSD TDMA terminal/F-15 DT&E/IOT&E	Jul 84-Mar 85
ASIT follow-on operational test and evaluation (FOT&E)	Nov 84-Jan 85
Class 2 TDMA terminal production decision	Jun 85
Class 2 production TDMA terminal/F-15 integration FOT&E	1987 time frame

An IOT&E of a TDMA JTIDS Class 1 ADM terminal installed in an E-3A was conducted during May-June 1978 by AFTEC. Major emphasis was placed on assessing the resistance of JTIDS to electronic countermeasures (ECM). The test demonstrated

the potential to greatly enhance digital information distribution. Problems associated with the establishment of the JTIDS net and net operations were identified during testing. The operational suitability could not be conclusively determined due to reliance on the contractor for system maintenance and support, the limited test period, and the small number of failures. AFTEC recommended that further operational suitability testing of the JTIDS Class 1 terminal be conducted. The results of the E-3A/JTIDS IOT&E were reported in the AFTEC E-3A Joint Tactical Information Distribution System (JTIDS) Terminal IOT&E Final Report (U), December 1978, SECRET.

Additional DT&E/IOT&E of JTIDS in the E-3A was conducted between 15 September and 30 October 1981, using a preproduction Class 1 terminal. Eighteen sorties were flown. The test included the use of three ASITs interfaced with both Army and Air Force ground command and control facilities. It was determined that the addition of JTIDS

However, it was determined that, as the

Because the Class 1 terminal failed to meet the adjusted mean time between

(661)

maintenance threshold, terminal reliability was rated deficient. Air Force Test and Evaluation Center published the results of this test in an evaluation report titled US/NATO E-3A Initial Operational Test and Evaluation Final Report (U), March 1982, SECRET.

(U) The ASIT provides a transparent interface between JTIDS-equipped systems (such as the E-3A) and existing command and control systems which use Tactical Digital Information Link B (TADIL-B). The ASIT consists of two principal subsystems. The first is a translator-processor (computer) which converts existing Tactical Air Control System/Tactical Air Defense System (TACS/TADS) messages passed over TADIL-B into JTIDS equivalent messages and vice versa. The second subsystem is the JTIDS Class 1 Terminal which performs signal transmission, reception, and related digital processing of the JTIDS signal.

(U) An IOT&E of three ASITs was conducted by AFTEC, assisted by the Army and Marine Corps test organizations, in a multiservice combined DT&E/IOT&E at Eglin AFB, Florida, from November 1979 to December 1980. Principal units/facilities to which the ASIT was been interfaced are an Air Force Message Processing Center, an Air Force Control and Reporting Center, an Air National Guard Control and Reporting Post, an Army AN/TSQ-73 Air Defense Command and Control System, and a Marine Corps Tactical Air Operations Center. The ASIT IOT&E confirmed the findings of the 1978 E-3A/JTIDS ADM terminal IOT&E that JTIDS provides an ECM-resistant data link between the E-3A and ground command and control elements. The test also demonstrated that JTIDS provides solid data-link communications that were relatively easy to establish and maintain. Although maintenance was performed exclusively by contractor personnel with military personnel being limited to over-the-shoulder observation, overall operational suitability was found to be deficient. This was due to the low reliability of the JTIDS Class 1 terminal. Test results are documented in the Joint Tactical Information Distribution System (JTIDS) Adaptable Surface Interface Terminal IOT&E Air Force Evaluation Report (U), March 1981, SECRET.

(U) A continuation of the operational suitability portion of the ASIT IOT&E was conducted by AFTEC during May-December 1981. During the evaluation, the ASIT equipment (less the Class 1 terminal) was maintained by Air Force technicians. Because technical data and support equipment were not available for the Class 1 terminal, it was contractor maintained. The reliability of the Class 1 terminal demonstrated significant improvement over the results obtained during the original ASIT IOT&E, and overall suitability was found to be satisfactory. AFTEC recommended an FOT&E be conducted on an ASIT production terminal to assess the impact of the major programmed changes in the terminal. The FOT&E is planned from November 1984 - January 1985 at Elgin AFB, Florida. Test results of the suitability evaluation are documented in the Joint Tactical Information Distribution System (JTIDS) Adaptable Surface Interface Terminal Suitability Evaluation Final Report, March 1982.

(U) A preliminary evaluation of JTIDS implementation in fighter aircraft was conducted between June 1981 and January 1982. A Singer-Kearfott AN/URQ-28 ADM JTIDS terminal and associated support equipment were installed in an AN/ALQ-76 pod which is designed for use on Maverick-capable aircraft and makes use of existing controls, displays, and pylon interfaces. The pods was primarily designed to give early hands-on fighter experience with JTIDS. Three such pods were flown on F-4 and A-10 aircraft to evaluate the contribution of JTIDS in defensive counterair, close air support, and air interdiction mission roles. Fifteen JTIDS missions were flown during the test. The terminal demonstrated the potential to enhance mission effectiveness of fighter aircraft in the conduct of all three of these mission areas. Tactical situation awareness was improved through the use of JTIDS with a corresponding reduction in the need for voice communication. The JTIDS display provided the fighter crews with the same general air picture that was available to the weapons controller in either surface or airborne command and control units. The enhanced situation awareness provided to the aircrews of the fighter aircraft reduced the requirements for voice commands, attack vectors, and threat warnings. This, in turn, reduced the weapons controller workload. However, since the usefulness of the JTIDS-display is primarily dependent upon

upon the timeliness and accuracy of the information provided to the net, accurate tracking of hostile aircraft becomes essential. This requirement tended to increase the surveillance operator workload when the auto-tracking feature of the TACS was degraded. Operational suitability was not evaluated during the test because there are no plans to produce a JTIDS terminal in a pod configuration. The test results were published in a test report titled Joint Tactical Information Distribution Sytem (JTIDS) Class 2 Advanced Development Model Terminal (Pod Configuration) Initial Operational Test and Evaluation Final Report (U), April 1982, CONFIDENTIAL.

(U) A DT&E/IOT&E will be conducted on a Class 2 FSD fighter terminal internally installed in a temporary configuration on three F-15 aircraft during 1984-1985. This test will be conducted at Elgin AFB, Florida, and Nellis AFB, Nevada. The IOT&E will evaluate the contribution of JTIDS to the effectiveness of the F-15 in its air-to-air roles. Suitability data will be collected as well. A production decision for the terminal will follow the test in June 1985. Assuming a favorable production decision for the terminal in 1985, an FOT&E of the permanent integration of the Class 2 into the F-15 in the 1987 time frame may be conducted.

(U) AFTEC Test Reports in JTIDS are summarized below:

1. (U) E-3A Joint Tactical Information Distribution System (JTIDS) Terminal IOT&E Final Report (U), December 1978 SECRET.

2. (U) Joint Tactical Information Distribution System (JTIDS) Adaptable Surface Interface Terminal IOT&E Air Force Evaluation Report (U), March 1981, SECRET

3. (U) US/NATO E-3A Initial Operation Test and Evaluation Final Report (U), March 1982, SECRET.

4. (U) Joint Tactical Information Distribution System (JTIDS) Adaptable Surface Interface Terminal Suitability Evaluation Final Report, March 1982.

5. (U) Joint Tactical Information Distribution System (JTIDS) Class 2 Advanced Development Model Terminal (Pod Configuration) Initial Operational Test and Evaluation Final Report (U), April 1982, CONFIDENTIAL

3. System Characteristics:

Characteristic	Objective	Demonstrated to Date
Frequency	960-1215 Mega Hertz	960-1215 Mega Hertz
Range	300 nautical miles (1200 nautical miles with relay)	300 nautical miles
Capacity	57.6 Kilo bits per second	57.6 Kilo bits per second
Users	2-2000	3
Message Error Rate	10^{-2}	10^{-2}
Anti-jam Margin		
Range Accuracy	300 feet at 150 nautical miles	To be determined

(U) Demonstrations of system characteristics are reported in the following test reports:

1. (U) "E-3A Joint Tactical Information Distribution System (JTIDS) Initial Operational Test and Evaluation Final Report" (SECRET), December 1978, Air Force Test and Evaluation Center, Kirtland Air Force Base, New Mexico 87117.

2. (U) "Joint Tactical Information Distribution System (JTIDS) Adaptable Surface Interface Terminal Initial Operational Test and Evaluation Air Force Evaluation Report" (SECRET), March 1981, Air Force Test and Evaluation Center, Kirtland Air Force Base, New Mexico 87117.

3. (U) "Joint Tactical Information Distribution System (JTIDS) Class 2 Advanced Development Model Terminal (Pod Configuration) Initial Operational Test and Evaluation (IOT&E) Final Report" (SECRET), April 1982, Air Force Test and Evaluation Center, Kirtland Air Force Base, New Mexico 87117.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64756F
DOD Mission Area: #327, TIARA for Tactical Air Warfare

Title: Side Looking Airborne Radar (SLAR)
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING)($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	30,490	27,192	23,882	26,913	Continuing*	Not Applicable*
2037	SLAR Sensors	13,600	7,300	3,282	5,000	Continuing	Not Applicable
2451	SLAR Exploitation	15,240	19,892	20,600	21,913	Continuing	Not Applicable
2647	Manual Radar Reconnaissance Exploitation System (MARRES)	2,000					4,000

*Multi-task projects.

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This product oriented Program Element develops radar sensors, processors, software, and exploitation equipment for use on ground stations and reconnaissance aircraft including the RF-4C, TR-1 and potentially on the Advanced Tactical Airborne Reconnaissance System. The objective of this program is to develop and test advanced high resolution SLAR components and systems capable of collecting from an airborne platform, transmitting, processing, and exploiting reconnaissance and strike information during night and adverse weather conditions. Near real time SLAR imagery exploitation is performed in a ground processing station to achieve high resolution detection and to provide for radar collection. Imagery-derived fixed target location and [reports are then sent to theater users including battlefield command centers, intelligence centers and strike systems such as the Precision Location and Strike System (PLSS) and the Joint Surveillance Target Attack and Recognition System (JSTARS).

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in Thousands)

RDT&E	29,090	27,192	20,197		Continuing	Not Applicable

(U) FY 1982 $1.4M was added for airborne radar sensor spares during performance evaluation.

(U) FY 1984 $2.2M was added to fund completion of ASARS electronically steerable antenna testing and $1.7M was added to fund a change in location and scope of pre-deployment ground station testing.

Program Element: #64756F
DOD Mission Area: #327, TIARA for Tactical Air Warfare

Title: Side Looking Airborne Radar (SLAR)
Budget Activity: #4, Tactical Programs

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

Appropriation (Qty By FY) (PE 27215F)	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
3010 (0,3,3,3,3) ASARS RADARS		47,500	46,800	46,000	44,000	184,300
3080 (0,1,1,1,0) GROUND STATION COMPONENTS		880	25,354	173,548	-0-	199,782
3300 MILCON	14,000			2,000	15,000	31,000

5. (U) RELATED ACTIVITIES: Program Element 63208F, Reconnaissance Sensors/Processing Technology, is performing advanced development efforts in foliage penetration radar techniques. Program Element 27431F, Tactical Air Intelligence Systems Activities is developing advanced techniques for managing tactical reconnaissance information. Exploited SLAR data will be an input to this system. Program Element 27215F, TR-1 Squadrons, procures operational Advanced Synthetic Aperture Radar System (ASARS), SLAR sensors, and ground stations.

6. (U) WORK PERFORMED BY: This program is managed by Aeronautical Systems Division, Wright Patterson AFB, OH. Contractors for current effort are: Hughes Aircraft Corp, Culver City, CA, develops the ASARS and ASARS Deployable Processing Station (ADPS); Ford Aerospace, Palo Alto, CA, is developing the Tactical Exploitation Demonstration System (TREDS) to support TR-1 reconnaissance exploitation.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

Project: 2037, SLAR Sensors - The objective of this project is to develop the Advanced Synthetic Aperture Radar System (ASARS), ASARS Deployable Processing Station (ADPS), Electronically Scanned Antenna, and interface with other radar collection systems. The radar system will provide a unique capability to penetrate clouds and other atmospheric conditions in daylight or at night, operate at ranges beyond defensive threats, and provide accurate location and other intelligence about targets under conditions in which non-radar sensors are ineffective. Operational requirements include real time processing to achieve reliable detection, if possible). The sensor includes search swath) and spot modes with resolution of respectively. The antenna will scan up to

In FY 1982, development and test of the ASARS was completed. In FY 1983 ADPS engineering test will be completed, and the ADPS will be integrated with the Tactical Reconnaissance Exploitation Demonstration System at the test site. Studies and analyses of the Electronic Countermeasures (ECM) threat to ASARS II operation will be initiated. In FY 1984 Electronic Counter Countermeasures (ECCM) will be designed for the ASARS II production sensors to counter the post

The ASARS and ADPS prototypes will be shipped overseas with the TREDS for a projected

Program Element: #64756F
DOD Mission Area: #327, TIARA for Tactical Air Warfare

Title: Side Looking Airborne Radar (SLAR)
Budget Activity: #4, Tactical Programs

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: 2451, SLAR Exploitation

A. (U) Project Description: The objective of this project is to develop and test SLAR exploitation components and systems. SLAR reconnaissance systems provide a unique capability to penetrate clouds and other atmospheric conditions in daylight or at night, operate at ranges beyond defensive threats, and provide accurate location and other useful intelligence about targets under conditions in which non-radar sensors are ineffective.

Operational requirements include near real time processing and exploitation (less than to achieve reliable detection, if possible) and location of fixed, mobile, moving, tactical size targets (SAM's, trucks, tanks) over wide areas nautical mile swaths). To meet these requirements, advanced digital exploitation technologies will be used. Lack of near real time image exploitation limits information timeliness of current operational SLAR systems.

(U) The Advanced Synthetic Aperture Radar System (ASARS) is the baseline operational sensor to be exploited. The development of the image exploitation/data handling segment for the ASARS system is the highest priority element of this project. This includes development of the Tactical Reconnaissance Exploitation Demonstration System (TREDS) and design of the TR-1 Ground Station (TRIGS).

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Program: TREDS Preliminary Design Review (PDR) was completed. The United States and the Federal Republic of Germany (FRG), through a formal agreement, shared the use of the SLAR processing equipment, designated as ABLE, in Germany. Per the agreement, the FRG operated and evaluated the ABLE System for three months. Evaluation of automatic change detection in ABLE was completed concurrent with FRG test and evaluation, and the results are being considered for use in the production TR-1 Ground Station (TRIGS).

(2) (U) FY 1983 Planned Program: TREDS Critical Design Review (CDR) will be completed. Appropriate elements of the TREDS will be integrated with the radar ground processing system as a part of the initial production ground processing and exploitation system specification preparation.

(3) FY 1984 Planned Program: TREDS integration with the radar ground processor will be completed and the radar imagery portion of TREDS will undergo full scale testing at a remote site in the U.S. The system will be shipped to Europe for FY 1984 is the fiscal years of engineering development funding for this prototype SLAR exploitation facility. Funding estimates are based on the contractor's technical and financial performance since contract start June 1981. The TRIGS design will be initiated.

1.17

Program Element: #64756F
DOD Mission Area: #3, TIARA for Tactical Air Warfare

Title: Side Looking Airborne Radar (SLAR)
Budget Activity: #4, Tactical Programs

(4) Program to Completion: Commencing in radar imagery exploitation will be conducted in the TREDS, and the results will be applied during the final development of hardware and software for the production TR-1 Ground Station (TRIGS). This period of collection and analysis in TREDS is termed the Interim Operational Capability (IOC). Following IOC, product improvements will be incorporated through to include electronic counter-countermeasures and interoperability with the RF-4C radar. Design of the production TR-1 Ground Station (TRIGS) will be complete in TRIGS will be deployed to in Europe in

C. Major Milestones:

Milestones	Dates
A. Complete Preproduction Prototyping (TREDS Development)	December 1984
B. Initial Operational Capability (TREDS)	
C. Full Operational Capability (TRIGS)	

* Date presented in FY 1983 Descriptive Summary.

(U) EXPLANATION OF MILESTONE CHANGES

B. of overseas testing prior to declaring an in-theater operational capability.

BUDGET ACTIVITY: Tactical Programs, 04 (SLAR)
PROGRAM ELEMENT: 64756F, Side Looking Airborne Radar

SIDE LOOKING AIRBORNE RADAR (SLAR)

Test and Evaluation Data

1. (U) Development Test and Evaluation (DT&E): The SLAR system development is based upon a building block approach to providing a Tactical Reconnaissance System called TR-1. The TR-1 Reconnaissance System acquisition is a follow-on to the U-2R. Test and Evaluation plans and reports of completed evaluations are documented in special access programs and will be made available to appropriately cleared personnel. Tests on the Advanced Synthetic Aperture Radar System (ASARS) sensor began in fiscal year 1981. Tests on the ground processing and exploitation station are planned for fiscal year 1983 through fiscal year 1984.

DT&E of the processing and reporting is complete. This system completed contractor integration and testing in October 1979, and Initial Operational Test and Evaluation in March 1980. All test program action items are complete, and all system deficiencies have been either addressed via changes to ongoing contracts, or programmed for outyear implementation pending approval of funds. Air Force Test and Evaluation Center will conduct a follow-on test and evaluation on the second generation scheduled for delivery in fiscal year

The Advanced Synthetic Aperture Radar System (ASARS II) development effort consists of three major projects managed by the Aeronautical Systems Division. Two of these projects are with the Hughes Aircraft Corporation for development of an airborne sensor and a ground processor. The third project involves design of a ground facility to exploit ASARS imagery. Multiple program requirements are being addressed in these ASARS and related projects to meet the need for strategic/national and tactical Side Looking Airborne Radar collection, processing, timely exploitation and reporting during peace, crisis and war.

These tests are documented in the Descriptive Summary for Program Element 64756F.

2. (U) Operational Test and Evaluation: An Operational Test and Evaluation (OT&E) of the Side Looking Airborne Radar (SLAR) exploitation segment will be conducted in conjunction with the TR-1 Reconnaissance System OT&E. The purpose of the OT&E is to evaluate the aggregate system capability to provide near-real-time intelligence information to tactical commanders.

The Air Force Test and Evaluation Center will plan and manage operational testing of the Advanced Synthetic Aperture Radar System, Tactical Reconnaissance Exploitation Demonstration System (TREDS), and the TR-1 Ground Station (TRIGS). The system will be evaluated for a period of one year in the European operational environment beginning with deployment of the ASARS radar and prototype TREDS ground station in A one year capability assessment will also follow deployment of the production ground station (TRIGS) in The Strategic Air Command, the Tactical Air Forces, Air Force Logistics Command, Air Force Systems Command, Electronic Security Command, Air Force Communications Command, Air Training Command, and US Army Intelligence Center and School will support the operational testing. Testing will be conducted as follows:

Advanced Synthetic Aperture Radar System: Since 1 November 1982 Air Force Test and Evaluation Center has been conducting an operational utility evaluation of the airborne sensor in support of the sensor production decision. This initial evaluation is based on the limited capabilities of the sensor while operating with the Interim Digital Processing Station (IDPS). The full assessment will be conducted using the prototype ASARS Deployable Processing Station (ADPS) which provides full sensor operational capability. Testing will be done during the initial CONUS integration and testing of the TREDS and will continue during the overseas OT&E described above. Collected data will support the ADPS production decision, identify any operational deficiencies, and recommend desirable growth potential to the basic system. An estimate will be made of the operational effectiveness and suitability of the sensor and will address both strategic and tactical mission requirements in January 1983.

Tactical Reconnaissance Exploitation Demonstration System (TREDS): TREDS development will provide an interim operational ground facility. This demonstration prototype will contain the same primary functions and interfaces as the final production facility, although at a reduced capability. Operational test and evaluation (OT&E) and developmental test and evaluation (DT&E) will be combined to provide inputs for the final facility design and to evaluate the capability of the aggregate system to support the operational mission. The Air Force Test and Evaluation Center will plan and manage the operational testing during the combined DT&E/OT&E at Ford Aerospace and Communications Corporation, Western Development Laboratories, Palo Alto, California for nine months beginning and at the designated operational location for one year beginning

(U) TR-1 Ground Segment (TRIGS): The Air Force Test and Evaluation Center will plan and manage the first phase of a two phased operational test and evaluation of the final system. United States Air Forces Europe will manage the second phase. The operational test and evaluation (OT&E) program will include TRIGS and will concentrate on changes/enhancements over the interim system operational capability provided by TREDS. The OT&E will evaluate the aggregate system ability to support the required full operational capability. The scope of the testing will be determined by the extent of changes from the interim system (TREDS) to the full system (TRIGS).

(U) As described in the TR-1 Squadron Congressional data sheet, the operational test and evaluation programs for both the interim and final capabilities will evaluate the system as an integral unit. The Air Force Test and Evaluation Center will publish reports upon completion of the operational assessment of the Advanced Synthetic Aperture Radar System sensor and the interim and final capability test p ograms. These reports will provide estimates on the overall system operational effectiveness and suitability and identify any deficiencies.

(U) OT&E reports published:

(1) (U) RTASS IOT&E Test Report, ESC, March 1980 (S/SCI).

(2) (U) Follow-up RTASS IOT&E Report, ESC, September 1981 (S/SCI).

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 64779F   Title: Joint Interoperability of Tactical Command and Control Systems (JINTACCS)
DOD Mission Area: #344, Tactical Command and Control   Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	7,472	3,837	5,567	4,023	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: JINTACCS is a joint interoperability program to provide improved operational effectiveness of Service (Army, Navy, Air Force, Marine Corps) tactical command and control systems planned for use in support of joint operations through the 1980s. Air Force objectives are to: develop interface design standards with the other services; modify affected Air Force equipments; participate in testing and joint operational effectiveness demonstrations; recommend joint standards for adoption by the North Atlantic Treaty Organization and prepare Air Force facilities for the implementation and configuration control of JINTACCS interface standards.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

7,472	3,837	5,752		Continuing	Not Applicable

- The slight decrease in the FY84 funding estimate ue to FY83 RDT&E congressional action and inflation of purchasing power.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

- None

5. (U) RELATED ACTIVITIES: This program element supports Air Force participation in the JINTACCS Program with the Marine Corps, Navy, and Army as Joint Chiefs of Staff (JCS) Executive Agent. Service and agency activities are governed by jointly agreed upon and JCS approved documentation including Technical Interface Concepts and Technical Interface Design Plans. Close liaison across each of the Service JINTACCS programs precludes duplication of efforts. The Service related JINTACCS program elements/projects are: PE 64780M, Joint Interoperability Tactical Command Control System; PE 64779N, JINTACCS Program; PE 64779A, JINTACCS (including projects D298-JINTACCS Executive Agency NATO, D309- JINTACCS Army and D310-JINTACCS Executive Agent)

Program Element: # 64779F Title: Joint Interoperability of Tactical Command and Control Systems (JINTACCS)
DOD Mission Area: #344, Tactical Command and Control Budget Activity: #4, Tactical Programs

6. (U) WORK PERFORMED BY: The Tactical Air Force Interoperability Group, TAFIG, is coordinating and implementing authority for Air Force participation in the JCS JINTACCS Program. Research and Development funds-management responsibility is assigned to the Air Force Systems Command, Electronic Systems Division, Hanscom AFB, MA. The Tactical Air Command provides operational support, including a Participating Test Unit at the Air Force Tactical Systems Interoperability Support Center at Langley AFB, VA, to support compatibility & interoperability testing and operational effectiveness demonstrations. The JINTACCS contractors are Planning Research Corporation McLean, VA; Systems Development Corporation, McLean, VA; Martin-Marietta, Denver, CO. and the MITRE C^3 Division, a Federal Contract Research Center, located at Bedford MA.

7. (U) JINTACCS (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984)

A. (U) Project Description: Joint Interoperability of Tactical Command and Control Systems (JINTACCS) was established in August 1977 as the successor to the Ground and Amphibious Military Operation (GAMO) Program. Its purpose is to improve the operational effectiveness of the Service (Army, Navy, Air Force and Marine Corps) command and control systems used in support of Joint Operations through the 1980s. Also incorporated are the intelligence facilities of the National Security Agency and the Defense Intelligence Agency. Consideration of NATO interoperability was added in 1978. The Services and Agencies are utilizing the program to develop common interface standards and to modify their command and control equipment and procedures as necessary to insure systems interoperability, compatibility and operational effectiveness. To facilitate management, the program is divided into functional segments including intelligence, air operations, amphibious operations, fire support, operations control, and TADIL J. Within the Air Force, the primary command and control facility interfaces to be analyzed and defined exist within the Tactical Air Control Center (TACC), Control and Reporting Center/Post, Direct Air Support Center, Airborne Warning and Control System, Airborne Battlfield Command and Control Center and the intelligence element supporting the TACC. An Air Force test facility identified as the Participating Test Unit has been established to evaluate Air Force modified command, control and communications elements, to support testing and demonstrations, and to provide ongoing configuration control. The JINTACCS program follows a methodology where Technical Interface Concepts (TIC) are defined and the initial Technical Interface Design Plans - Test Editions (TIDP-TE) are completed. Following modification of the test systems, Developmental Certification (DC) testing is performed, the TIDP-TE modified, Operational Effectiveness Demonstration (OED) conducted, and a final TIDP published for incorporation into JCS pubs. The overall goal is to achieve Joint compatibility and interoperability among Tactical Command & Control Systems from each Service.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Completion and analysis of the Intelligence functional segment Operational Effectiveness Demonstration. Completion of Developmental Certification testing for the Air Operations functional segment and the Operations Control functional segment. Completion of the Technical Interface Design Plans - Test Editions for the incorporation of TADIL J (bit-oriented messages) functional segment. Conduct of the Fire Support table-top exercise in preparation for Fire-Support Development Certificate testing.

(2) (U) FY 1983 Program: Continued refinement of Technical Interface Design Plans and Preparation for the Air Operations/ Intelligence functional segment operational effectiveness demonstration. Conduct of the Air Operations/Intelligence operational effectiveness demonstration and analysis of results. Completion of Technical Interface Design Plans maintenance tests for Air Operations, Intelligence and Operations control segments.

Program Element: # 64779F   Title: Joint Interoperability of Tactical Command and Control Systems (JINTACCS)
DOD Mission Area: #344, Tactical Command and Control   Budget Activity: #4, Tactical Programs

(3) (U) *FY 1984 Planned Program and Basis for FY 1984 RDT&E Request*: Interface planning, analysis and design efforts will continue during FY 1984 as well as modification of test-only hardware and software. Test planning and support will be provided for the execution and analysis of Developmental Certification testing for the Fire Support and Amphibious functional segments. Procurment of the baseline portion of the Participation Test Unit's test support system for test support and configuration control will be completed. Configuration management tsting of all, and any new, segments will continue. Planning for implementation of Air Operations and Intelligence segments will be pursued.

(4) (U) Program to Completion: The remaining functional segments will be tested for compatibility and interoperability and will be followed by operational effectiveness demonstrations. The technical interface design plans will be updated and subsequently incorporated as standards into appropriate Joint Chiefs of Staff publications.

C. (U) MAJOR MILESTONES:

- Intelligence Operational Effectiveness Demonstration	May 81
- Air Operations/Intelligence Operational Effectiveness Demonstration	May 83
- Operations Control, Fire Support and Amphibious Operational Effectiveness Demonstration	May 85
- TADIL-J Operational Effectiveness Demonstration	May 88

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #27129F
DoD Mission Area: #233, Close Air Support and Interdiction

Title: F-111 Squadrons
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	2,690	38,290	84,358	110,671	33,794	278,650
2056	PAVE TACK/VATS	2,690	2,690	1,358	8,571	700	26,186
2952	F-111 Avionics Intermediate Stations		35,700	31,300	28,100	33,094	133,200 1/
2962	F-111 Avionics Modernization Program			51,700	74,000		131,300

1/ FY 82 funding of $7.5 million under Appropriation 3400, PE 27129F is included in total. Funding in FY 83 and beyond changed to Appropriation 3600 based on the determination that software tasks should be categorized R&D.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides funds for development activities associated with F-111 aircraft. The first development activity is enhancement to the PAVE TACK System, which is a Forward Looking Infrared (FLIR) target acquisition and laser designator/ranger. This system enables two-seat tactical aircraft to deliver precision guided and unguided weapons during day or night. A conversion from the current analog electro-optic FLIR to digital FLIR in the PAVE TACK System will reduce maintenance and support costs. A digital FLIR will also enhance effectiveness of the system through automatic FLIR display controls for rapid adjustment to each target scene.

(U) The second development activity is an engineering effort to prepare Computer Programs for Test Program Sets as a part of the program which has been implemented to replace the existing F-111 Avionics Intermediate Shop Automatic Test Stations. Each Test Program Set will include the hardware adapters and software test programs required to test an F-111 avionics component or group of similar components. Replacement of the existing F-111 Avionics Stations is necessary because these stations have become obsolete, unreliable, and unsupportable.

(U) The F-111 Avionics Modernization Program is the third development activity and encompasses the changes to the bomb navigation system desired for reducing maintenance and support costs associated with high failure, high cost, and technologically outdated components.

Program Element: #27129F Title: F-111 Squadrons
DoD Mission Area: #223, Close Air Support and Interdiction Budget Activity: #4, Tactical Programs

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

RDT&E	2,690	39,290	36,571	-	72,247	168,886
Procurement (Aircraft)(3010, P-1200)	37,700	86,000	65,500	-	177,600	366,800

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
F-111 AIS Test Set Procurement (Aircraft) (3010, P-1200)	35,300	64,100	69,900	81,600	19,100	270,000
(3010, P-1600)		2,700	3,000	3,500	800	10,000
(3080, P-8400)		2,900	2,400	3,100	4,000	12,400
F-111 Avionics Modernization Program (3010, P-1900)	-	-	14,000	189,800	655,200	859,000

EXPLANATION OF CHANGES: The F-111 Avionics Modernization Program has been added into this program element because of the portions of the program requiring R&D funding. A reduction in AIS test set procurement cost from $366.8 million to $292.4 million results from updated determination of F-111 components requiring support from new test sets.

5. (U) RELATED ACTIVITIES: The DOD common-module Forward Looking Infrared (FLIR) sensor which is used in the PAVE TACK pod was developed in Program Element (PE) 64710F, Reconnaissance Equipment. The Video Augmented Tracking System (VATS), initially developed under PE 63203F, Advanced Avionics for Aircraft, was transitioned into the PAVE TACK project for integration and flight testing.

6. (U) WORK PERFORMED BY: All PAVE TACK Air Force development effort is being managed by the Aeronautical Systems Division, Wright-Patterson AFB, OH. The initial engineering study on upgrading the F-111A/E from the current analog system to a digital bomb/navigation system was performed by General Dynamics, Fort Worth, TX. The PAVE TACK contractors include PAVE TACK Pod and F-4 Integration, Ford Aerospace, Newport Beach, CA (Prime Contractor); and FLIR, Texas Instruments Dallas, TX. Flight test responsibility has been assigned to the Armament Division at Eglin AFB, FL. The F-111 Avionics Intermediate Shop competitive procurement is being managed by San Antonio Air Logistics Center, TX. The F-111 System Manager is located at Sacramento Air Logistics Center, CA.

7. (U) *PROJECT LESS THAN $10 MILLION IN FY 1984*:

(U) Project 2056: PAVE TACK/VATS: This project includes timely improvements to the PAVE TACK laser designator System on F-111, F-4E and RF-4C aircraft. PAVE TACK consists of a Forward Looking Infrared (FLIR) sensor, laser target designator/ranger, slewable optics and necessary digital control electronics for target acquisition day and night. The Video Augmented Tracker System (VATS) automates the tracking of targets and increases total effectiveness of the system.

Program Element: #27129F Title: F-111 Squadrons
DoD Mission Area: Close Air Support and Interdiction #223 Budget Activity: Tactical Programs, #4

Other significant improvements included in this project are conversion from analog to digital FLIR for better life cycle cost and evaluation of automatic handoff to off-boresight weapons.

(U) Operational Test and Evaluation of VATS on the F-111F was completed in FY 82 and studies for automatic handoff were initiated. In FY 83, automated adjustment of the FLIR controls and development of digital FLIR will be initiated for full-scale development. Countermeasure studies for determining cost effective hardware changes to improve potential against countermeasures will be continued. In FY 1984, development will be initiated for integration of PAVE TACK Acquistion capability with AGM-65 Maverick control to insure accurate and timely pointing of the Maverick seeker at the target selected. Digital FLIR will be flight tested prior to a decision on production buy in FY 1985. Development will continue for integration of PAVE TACK and Maverick on F-111 aircraft, leading to modification decision in late FY 83.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project 2952: F-111 Avionics Intermediate Stations

A. Project Description: This project is driven by a pressing need to replace the existi~~ F/FB/EF-111 AIS test stations. These existing stations are obsolete, unreliable, and costly to maintain. The replacement approach was chosen over other alternativ based on a 20-year life-cycle analysis which showed this to be the most cost-effective solution. This project is implemented by PMD L-Y 1027(1), 22 Jan 81. This PMD implements a program to replace 292 test stations of 29 different types with a smaller number of current technology, computer controlled automatic test stations capable of supporting the 300 line replaceable units in the 1985 F/FB/EF-111 avionics baseline. These new stations will be delivered as 21 shop sets. The PMD requires use of existing designs and minimum development effort. The total program directed by the PMD draws its funding from several sources; the RDT&E funds will be used specifically for development of the computer software which will test the aircraft avionics components on the new test stations. (This software is called test software. The test software and hardware adapter used to test one avionics component or family of similar avionics components are called a test program set.) This software development effort will make maximum use of the test software and documentation already developed and in use with the existing AIS stations.

B. (U) Program Accomplishments and Future Programs:

(1) (U) FY 1982 Accomplishments: Conducted a detailed comparative analysis of the replacement approach as opposed to an alternative which called for modernization of the existing AIS test stations, acquisition of a number of dynamic test stations to augment the existing AIS, and increased support of modernization of aircraft avionics to improve reliability. Determined replacement approach to be more cost effective. Issued request for proposals to industry.

(2) (U) FY 1983 Program: A contract has been awarded to a team consisting of Westinghouse and Bendix for production of the replacement test stations. Activities will include design and engineering of the hardware and software for the new stations. Development effort will be for engineering and modification of approximately 20 test program sets.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Design and engineering of the test stations will continue. Development effort will be for engineering and modification of approximately 40 test program sets. The first station will be fabricated and delivered. Costs based on contract recently awarded after competitive selection.

(4) (U) Program to Completion: Design and engineering will be completed and the test stations will be produced, tested, and delivered. The final station will be delivered during FY 1987.

C. (U) Major Milestones:

Milestones	Dates
(1) First Delivery	Dec 1984
(2) IOC	Mar 1986

9. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project 2962: F-111 Avionics Modernization Program

A. (U) Project Description: The FB-111 Avionics Modernization Program will consist of updates to the attack radar, terrain following radar, inertial navigation, control and display, and doppler radar system. The F-111 update consists of the addition of the weapons navigation computer (A/E/EF) and the multiplex converter (A/E/EF/F), terrain following radar (all) and control and displays (A/E/EF) system. These modification are expected to raise the MTBF of the overall system from the current five hours to approximately 20 hours. Based upon the General Dynamics computer model this modification will result in a 13% increase in sortie rates and a 38% increase in expected target kills. This modification will ensure system supportability into the 1990's.

B. (U) Program Accomplishments and Future Programs:

(1) (U) FY 1982 Accomplishment: Not funded.

(2) (U) FY 1983 Projected Accomplishments: Initiate engineering development efforts on the attack radar system, terrain following radar system and associated software.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Continue engineering development on the radar systems and associated software. Fabrication of the updated attack radar and improved bomb/navigation systems will begin in preparation for FY 85 flight testing. Costs are grassroots projections provided by the System Management Office.

(4) (U) Program to Completion: Complete engineering development on the radar systems, complete necessary

Program Element: #27129F
DoD Mission Area: Close Air Support and Interdiction #223

Title: F-111 Squadrons
Budget Activity: Tactical Programs, #4

software engineering and make production decision based upon flight test results in FY 85. Production to begin in FY 86 with key deliveries and installations to begin in FY 87.

C. (U) Major Milestones:

Milestones	Dates
(1) Radar Software & Initial Development	Sep 82
(2) Production Contract Award	Nov 83
(3) System Integration Testing	Oct 84
(4) IOT&E	Jan 85
(5) Delivery of First FB-111	Dec 86
(6) Delivery of First F-111A/E	Mar 88

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #27130F
DOD Mission Area: Counter Air, #221

Title: F-15 Squadrons
Budget Activity: Tactical Programs, #4

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
TOTAL FOR PROGRAM ELEMENT		32,288	104,812**	117,774	68,845	25,839	2,464,400
*0131	F-15 A-D	32,288	104,812**	117,774	68,845	25,839	2,464,400

* Contains $13.0M in FY 83 for F-15/F-16 comparative evaluation. PE# 27132F now contains the Derivative Fighter RDT&E and procurement funds in FY 1984 and FY 1985.

** This amount reflects a reduction of $8M in FY 83 as an administrative reduction for a directed reprogramming action and once actual sources are identified, this amount will be restored to this program.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The F-15 is a high performance, highly maneuverable fighter equipped with a long range look-down radar and a balanced mix of air-to-air weapons to provide an outstanding close-in visual and medium range all-weather kill capability. Designed specifically to gain and maintain air superiority, the F-15 has significantly upgraded United States Air Force Tactical Forces capability in the counter-air and tactical support missions. Continued production of the F-15 satisfies force structure modernization and expansion requirements and permits replacement of the aging F-106 in the Air Defense role.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	32,300	125,300	127,300	---	90,300	2,482,600
Procurement (Aircraft)*	1,175,000	1,682,300	2,156,700	---	21,283,400	36,925,400
(Quantity)	(36)	(42)	(60)	---	(576)	(1395)

* Includes initial spares

** The FY 84 RDT&E Descriptive Summary reflects the congressional cut of $12.3M in FY 83 from the F-15 portion of a Derivative Fighter comparative evaluation flight test. The funding in FY 84 and out reflects the deletion of all RDT&E and procurement for derivative fighter development. PE 27132F was created to address the derivative fighter funding.

Program Element: #27130F
DOD Mission Area: Counter Air, #221

Title: F-15 Squadrons
Budget Activity: Tactical Programs, #4

4. (U) OTHER APPROPRIATION FUNDS: ($ In Thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Procurement (Aircraft)*	1,154,500	1,431,000	2,127,400	3,132,200	20,557,900	39,034,700
(Quantity)**	(36)	(39)	(48)	(72)	(576)	(1452)

* Includes initial spares

** The F-15 procurement estimate of 1488 aircraft supports Air Force efforts to achieve a 44 tactical fighter wing force structure by the early 90's. Cost estimates have been provided that support the optimum build to the required tactical fighter force structure. This funding contains a multiyear procurement in FY 84-FY 87. Balanced procurement of F-15 and F-16 aircraft will continue until availability of the Advanced Tactical Fighter (ATF) is assured.

5. (U) RELATED ACTIVITIES: The Tactical Electronic Warfare System for F-15 application is being developed in Program Element (PE) #64739F, Tactical Protective Systems. AIM-9L, AIM-9M, AIM-7F and AIM-7M (Advanced Monopulse Seeker) air-to-air missiles are being procured for use on the F-15 and other aircraft under PE #27161F, Tactical Air Intercept Missiles. The Joint Tactical Information Distribution System (JTIDS) is being developed for use on multiple aircraft including the F-15 under PE #64754F, JTIDS. The Advanced Medium Range Air-to-Air Missile is being developed under PE 63314F. Generic radar algorithms, applicable to programmable signal processor radars, and computer software are being developed under PE #64201F, Aircraft Avionics Equipment Development, for possible use in the F-15 and other fighter aircraft. Capability is being developed under PE 64406F for designated air defense F-15s to support the air launched anti-satellite (ASAT) mission.

6. (U) WORK PERFORMED BY: The F-15 development program is being managed by the F-15 Program Office, Aeronautical Systems Division, Wright-Patterson Air Force Base, OH. McDonnell-Douglas Corporation, St Louis, MO, is the prime contractor for development and production of the F-15 aircraft. Pratt & Whitney Division of the United Aircraft Corporation, West Palm Beach, FL, is the engine contractor. Hughes Aircraft Company, Culver City, CA, is the radar subcontractor to McDonnell-Douglas Corporation.

7. (U) PROJECTS LESS THAN $10M IN FY 1984: "Not Applicable"

8. (U) PROJECTS OVER $10M IN FY 1984: Project 0131, F-15 Squadrons (Single Project in PE)

A. (U) Project Description: The F-15 is the most capable air superiority fighter in the world today. As such, it is the cornerstone to the accomplishment of all other tactical missions. With conformal fuel tanks, the F-15 can be deployed worldwide with minimal tanker support and arrive in a combat ready configuration. However, the Soviet/Warsaw Pact threat continues to grow quantitatively and qualitatively, with their new generation of aircraft possessing all-weather detection and kill capabilities. To maintain the F-15's superiority against the threat in the mid 1980's and through the 1990's, avionics improvements are required. Avionics changes which exploit proven technological advances

Program Element: #27130F
DOD Mission Area: Counter Air #221

Title: F-15 Squadrons
Budget Activity: Tactical Programs #4

will be incorporated into the F-15 to provide expanded air combat capabilities. These improvements include expanded Electronic Counter-Counter Measures (ECCM) and improved combat identification (ID) capability in the radar, updates to the electronic warfare suite, and incorporation of improved communications/identification equipment.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: FY 1982 RDT&E funds were used to continue conformal fuel tank certification tests; to continue integration of radar Programmable Signal Processor (PSP) improvements; to continue flight testing of radar, electronic warfare, and weapons updates; to initiate F-15/Advanced Medium Range Air-to-Air Missile (AMRAAM) integration and compatibility tests; and for management and engineering support. These avionics and armament improvements were grouped into a cost effective, comprehensive Multistaged Improvement Program (MSIP).

(2) (U) FY 1983 Program: A Multistaged Improvement Program (MSIP) was initiated in June 1982 to address specific capability requirements essential to counter the late 1980's and 1990's threat. The MSIP program is being conducted in four stages:

- Stage I - Development of Improved Avionics and Armament
- Stage II - Production Incorporation of Improved Systems
- Stage III - Cost Effective Fleet Upgrade Modification
- Stage IV - Air-to-Surface Evolution Improvements

MSIP tasks will be continued in FY 1983 in preparation for FY 1984 incorporation of the MSIP avionics/armament equipments. A comparative evaluation is being conducted in FY 1983 to compare the capabilities of derivative versions of F-15 and F-16 aircraft to fulfill the tactical air force's need for a long range, dual role fighter.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: MSIP design, development, and testing will be continued in FY 1984. New and modified Organizational and Intermediate (O&I) level Ground Support Equipment (GSE) will be designed, developed and tested to support the new and modified MSIP aircraft systems. FY 1984 aircraft will have the following systems/capabilities incorporated in production: Programmable Armament Control System; improved central computer (CC); weapon system compatibility with AIM-7M, AIM-9M, and AIM-120A; split screen video recording; provisions for improved radar warning receiver (RWR) (AN/ALR-56C); provisions for improved internal countermeasures set (ICS) (PAVE MINT), (F-15C only); and space, structural, electrical and cooling provisions for Anti-Jam Communications. FY 84 MSIP efforts will also concentrate on development of the improved air-to-air radar and full provisions for Anti-Jam Communications. F-15 retrofit kits will also be developed in FY 84. An Independent Cost Analysis (ICA) completed in Sep 82 provided an assessment as to the reasonableness of the cost estimates to support this FY 84 program. The funding requirements for RDT&E associated with the MSIP program represent efforts to maintain force strength without more expensive development efforts which could not be realistically fielded in the near term. The planned program efficiently and effectively extends the F-15 operational effectiveness and utility. The Air Force has identified the requirement for additional F-15s to sustain and modernize tactical forces, correct strategic defense force deficiencies, and satisfy force structure goals. The F-15 offers the flexibility and adaptability to fulfill a variety of air combat tasks worldwide.

Program Element: #27130F
DOD Mission Area: Counter Air #221

Title: F-15 Squadrons
Budget Activity: Tactical Programs #4

(4) (U) Program to Completion: This is a continuing program. The FY 1985 - 1987 RDT&E funding will be used to continue integration of improved hardware and software, radar air-to-air and ECCM features into the F-15; to complete F-15 armament systems integration; and for flight test of radar, electronic warfare and weapons updates. Funds continued F-15/AMRAAM integration, software design and qualification, continued mission support, flight test, and other activities. The FY 83 budget raised F-15 production to a more efficient rate and provided for advance procurement to support a needed FY 84/FY 85 procurement increase to 60 and 96 aircraft respectively. The increased rate coincides with the orderly incorporation of production avionics developed to improve the F-15 in its mission scenarios. An F-15 multiyear proposal is under consideration which would provide savings (FY 84-87) of $459 million then year dollars.

C. (U) Major Milestones:

	Milestone	Date	
A.	Award Total System Development Contract	January	1970
B.	Preliminary Design Review	September	1970
C.	Critical Design Review	April	1971
D.	Engine Preliminary Flight Rating Test	February	1972
E.	First Flight	July	1972
F.	Long Lead Release (Production Approval)	October	1972
G.	First Wing Full Release	February	1973
H.	Engine Qualification Test	October	1973
I.	Fatigue Test-3 Lifetimes	October	1973
J.	Increase Production Rate	January	1974
K.	Begin Air Force Development, Test, and Evaluation	February	1974
L.	Fatigue Test-4 Lifetimes	February	1974
M.	Second Wing Release	October	1974
N.	First Aircraft to Tactical Air Command	November	1974
O.	Initial Operational Capability (First Tng Sq)	September	1975
P.	First USAFE Operational Unit (Bitburg AB, FRG)	April	1977
Q.	First F-15C/D Aircraft Delivered (Kadena AB, Okinawa, JA)	July	1979
R.	First PACAF Operational Unit (Kadena AB, Okinawa, JA)	August	1979
S.	First Programmable Signal Processor Configured Radar (Camp New Amsterdam, NL)	June	1980
T.	First AMRAAM Firing (Unguided)	November	1980
U.	MCAIR IR&D Synthetic Aperture Radar (SAR) Demonstration (Volk Field, WI)	June-Oct	1981
V.	First AMRAAM Guided Launch	November	1981
W.	First ADTAC Conversion (Langley AFB, Va)	January	1982
X.	MCAIR IR&D SAR Weapons Delivery Evaluation (Eglin AFB, Fl)	Jan-Mar	1982
Y.	USAF Ten Flight Evaluation of SAR Demonstrator (Eglin AFB, FL)	March	1982
Z.	Upgraded Radar Software Operational Flight Program (OFP) (ECCM, Raid Assessment)	June	1982
a.	MSIP Phase I Initiated	June	1982
b.	MSIP Phase II to be Initiated	Feb	1983
c.	Upgraded Radar Software OFP (Long Range Search, TWS, Display)	March	1983
d.	F-15/F-16 Comparative Flight Evaluation Complete	June	1983
e.	First MSIP Aircraft Delivery (Projected)	June	1985

Budget Activity: Tactical Programs #4

Program Element: 27130F F-15 Squadrons

Test and Evaluation Data

(U) The F-15 test program encompasses Contractor Development Test and Evaluation &E), Air Force Development Test and Evaluation (AFDT&E), Air Force Initial Operational Test and Evaluation (and Follow-on Operational Test and Evaluation (FOT&E). The purpose of CDT&E and AFDT&E was to prov ssary test and analysis data to assure that an operational air superiority weapon system would be ava e at the earliest practical time. Test objectives addressed compliance with specifications, established performance capabilities, evaluated handling qualities, etc. IOT&E was conducted throughout Development Test and Evaluation (DT&E) to evaluate the operational capability and suitability of the F-15 weapon system. A portion of Tactical Air Command's (TAC) IOT&E involved their participation in eleven F-15 Air Force Preliminary Evaluations (AFPE). Additionally, seven Initial AFDT&Es were conducted during DT&E to permit Air Force Flight Test Center and TAC pilots to evaluate contractor fixes of mandatory correction items discovered during AFPEs and to accomplish early Air Force developmental and operational test objectives. Eighteen F-15As and two F-15Bs (two-seat version) were dedicated to the DT&E/IOT&E tests.

1. Development Test and Evaluation:

(U) As of 20 Oct 1982, the USAF and McDonnell Douglas DT&E test teams had accumulated 10365 test flights and 12798 flight hours on F-15 test aircraft during the 122 months of F-15 DT&E. Major activities from CY 1978 through CY 1980 included Tactical Electronic Warfare System AFDT&E, Air Intercept Missile Evaluation/Air Combat Evaluation computer software change evaluations, countermeasures dispenser set flight testing, F100 engine stall/stagnation and component improvement tests, F-15/F-16 radar mutual interference tests, improved 20MM ammunition tests, programmable signal processor CDT&E, F-15 C/D model DT&E, and numerous evaluations of weapon system improvements designed to satisfy recommendations resulting from earlier testing. The remainder of this paragraph summarizes the significant DT&E accomplishments in the F-15 program from the beginning of full scale development in January 1970 to date. The air vehicle critical design review and the avionics equipment development review were completed in April and June 1971, respectively. From July 1971, efforts were directed to fabrication of components and flight test airplanes and extensive ground testing of subsystems. Three demonstration milestones were completed in February 1972, including the Engine/Inlet Compatibility Test, the Structural Test of Major Subassemblies, and the Engine Preliminary Flight Rating Test (PFRT) Milestones. To obtain increased engine efficiencies over the PFRT engine (Series I configuration) the Air Force decided, in March 1972, to use the

Budget Activity: Tactical Programs #4

Program Element: 27130F F-15 Squadrons

alternate design being carried as a parallel effort. This engine became Series II, the configuration planned for Military Qualification Tests and for subsequent production. F-15 first flight occurred on 27 July 1972 beginning a highly successful flight test program. The flying qualities AFPE was completed in September 1972, with favorable results. The initial Airborne Avionics Performance Milestone was completed on 2 December 1972. Two structural demonstration milestones were completed in January 1973, including the Fatigue Test to One Lifetime and Static Test to Critical Conditions. The F100 engine endurance qualification test, delayed beyond planned completion date of February 1973 by technical problems, was successfully completed on 12 October 1973.

All major structural testing milestones were met when the fatigue tests to three and four lifetimes were completed in March 1974. The Air Force Development Test and Evaluation (AFDT&E) began at Edwards AFB in February 1974. The external Stores Flutter Release Milestone was completed in August 1974. With the exception of a single aircraft conducting limited armament follow-on testing, all Contractor Development, Test, and Evaluation (CDT&E) was completed in November 1974. All high angle-of-attack and spin testing was completed in August 1975. The Equipment Qualified Milestone was completed in March 1977, and the Aerospace Ground Equipment In-Place Milestone was completed in May 1977. Flight evaluation of the Air Intercept Missile Evaluation/Air Combat Evaluation changes to the computer software, F-15/F-16 radar mutual interference tests, and the AIM-9L integration effort were completed in 1978. AFDT&E of the AN/ALR-56 Radar Warning Receiver "New Threat" program was completed and an interim flight test report published in 1978. The New Threats consisted of three major improvements. One feature allows the ALR-56 to sort out and analyze

]capability. A second modification gives increased capability to detect threats that are

The final change, termed

Successful operation of the[

were demonstrated. However, the software tape still had New Threat related problems as well as some carry-over deficiencies from the current Operational Flight Program. Further development and testing was required before release. In 1978, CDT&E and AFDT&E of the Jet Fuel Starter air start capability was completed. Testing under the F100 Engine Component Improvement Program, including solutions to the F100 stall/stagnation problem, continued throughout 1979 and 1980. The susceptibility of the F100 engine to compressor stalls followed by stagnations and the resultant durability problems have been areas of major concern. With incorporation of planned fixes, all of which have been tested, the current F-15 stall/ stagnation rate of 1.0 incident per 1000 engine flight hours should be reduced. Development and test of the F-15 C/D model, Production Eagle Package 2000 improvement (2,000 lbs additional internal fuel, provisions for conformal fuel tanks and capability for higher take-off gross weight), which was initiated in mid 1976, was completed in late 1980. CDT&E and AFDT&E of the C/D model, which began in February and May 1979, respectively, was completed in 1980. CDT&E of the improved monopulse AIM-7M began in October 1979. Finally, development and test of the programmable signal

Budget Activity: Tactical Programs #4

Program Element: 27130F F-15 Squadrons

processor (PSP) for the F-15 radar, which began in 1978, continued through 1980. While containing some minor discrepancies, the first PSP operational flight program delivered in May 1980 was as good or better than current aircraft radar capabilities. The discrepancies were corrected with a tape revision in October 1980. The development of the Raid Assessment Mode (RAM) took longer than originally expected and was not incorporated until May 1981. The Joint Tactical Information Distribution System (JTIDS) interface definition final report was published in October 1980. JTIDS integration full scale development was initiated in December 1981. Maintainability and reliability testing of the F-15 Weapon System was a special subject of Operational Test and Evaluation as discussed below. Conformal Fuel Tank (CFT) flight testing is complete except for performance, flying qualities and store certification testing. FY 82 funding is supporting the certification of Conformal Fuel Tanks and BRU-26 weapons pylons. The first BRU-26 test flight will be in November 1982. Additional radar software qualification testing is continuing.

AFDT&E REPORTS

1. May 75, AFTTC TR-75-6 AFPE of the F-15 TEWS System
2. Dec 79, F-15 AFDT&E TEWS Phase III, AD-TR-79-84
3. Aug 77, F-15 AFDT&E TEWS Eval AFFTC-TR-77-4
4. Mar 81, Tape 066 OFP Verification AD-TR-77-4 (ALR-56)
5. 10 May 79, JFS Air Start Report AFTC Directive 78-129
6. 1 Apr 78, F-15 AFDT&E Air-to-Air Missile Evaluation (AIM-9L) AFFTC-TR-77-40
7. Feb 78, ACEVAL/AIMVAL Joint Test Force, Nellis AFB Vol I-IV by Rear Admiral Robert P. McKenzie, and Major General James R. Hildreth, USAF
8. 6 Sep 77, Air Intercept Evaluation (AIMVAL) Vol I-VI by Rear Admiral Ernest E. Tissot and Major General James R. Hildreth, USAF
9. Nov 79, F-15 APG-63 Radar, Hardware/Software Improvements, AFFTC-TR-72-2?
10. Jan 76, AFFTC-TR-75-32/F-15A approach to Stall/Post Stall Evaluation
11. Jul 76, TR-76-24, F-15 AFDT&E of Armament/Weapons Delivery System
12. CIP Task 005, F-15/F-16 Flight Test (engine)
13. Jul 77, AFFTC-TR-77-7, F-15 Performance AFDT&E
14. Sep 81, AFFTC TR-81-18, F-15C Limited T.O. and Landing Evaluation
15. Nov 80, AFTC TR-80-23, F-15C Flying Qualities, AFDT&E
16. Jul 77, AFFTC TR-76-48, F/TF-15A Flying Qualities, AFDT&E
17. Jan 76, AFFTC TR-75-32, F-15A Approach-To-Stall/Stall/Past Stall Evaluation

Budget Activity: Tactical Programs #4

Program Element: 27130F F-15 Squadrons

CDT&E REPORTS

1. 6 Mar 72, MDC A-1595, F-15 Full Scale Inlet/Engine Compatibility Test
2. 2 Aug 72, MDCA-1865, Final Report Propulsion Subsystem Endurance (pit 4 YF100 PW100 engine test)
3. Jan 73, MDCA-2104, F-15 Demonstration Milestone 10, Documentation Report - Initial Airborne Avionics Performance
4. 5 Jan 79, MDCA 5736, Test Program, JFS Airstart Capability in USAF airplanes, Flight Test Program, St. Louis, MO
5. 9 Nov 81, MDCA 7436, Version Description Document, (Computer Program for F-15 Indicator Group) (PSDP Operational Flight Program)
6. 25 July 79, MDCA 6084, F-15 C Final Flight Test Report
7. 16 Mar 72, MDCA 1617, Milestone VIII, F-15 Avionics Integration Test Status
8. 7 Mar 72, MDCA 1601, F-15 Structural Utilization Report
9. 28 Apr 72, MDCA 1688, Results of Fatigue/Static Test of F-15 Preproduction Design Verification, (PDV-1) wing carry through
10. 9 Nov 71, MDCA 1429, Static Test Results, Final Report
11. 27 Feb 73, MDCA 2198, VOL I-VIII, F-15 Fatigue Tests-FTA 1 for fuselage and Cockpit Fatigue Test

2. Operational Test and Evaluations:

(U) Initial Operational Test and Evaluation (IOT&E): The F-15 IOT&E was part of a combined IOT&E/Air Force and contractor Development Test and Evaluation (DT&E) conducted at Edwards AFB, California, using data from contractor and Air Force DT&E sorties flown July 1972 through 30 June 1975. The Initial Operational Test and Evaluation (IOT&E) was USAF directed, Tactical Air Command conducted, and Air Force Test and Evaluation Center monitored. The IOT&E provided estimates of system operational effectiveness and suitability in support of Defense System Acquisition Review Council decisions related to increased production rate. Specific test objectives addressed both air-to-air and air-to-ground mission roles. In the 2.5 year effort 4460 sorties were flown. The aircraft was found to have superior handling and flight characteristics in the air-to-air regime. Likewise the F-15 was shown to be an effective platform for air-to-ground ordnance delivery. The continual change of hardware and software throughout the test program precluded establishment of a reliability assessment data base. The immaturity of built-in test (BIT) and the absence of major test equipment items were limiting factors in the overall suitability evaluation.

Budget Activity: Tactical Programs #4

Program Element: 27130F F-15 Squadrons

(U) Follow-on Operational Test and Evaluation (FOT&E): The F-15 FOT&E was an independent test and evaluation managed by the Air Force Test and Evaluation Center (AFTEC) and conducted by the AFTEC test team at Luke AFB, Arizona. The objectives of FOT&E were to verify the operational effectiveness and suitability, which included assessment of the logistical supportability, life cycle costs, and identification of desirable modifications or trade-offs for the production F-15 system. The FOT&E commenced in March 1975 and finished in July 1976 using a total of 1111 F-15 sorties and approximately 900 support sorties. Evaluation sorties were flown by AFTEC and Tactical Air Command pilots. Once again, the F-15 was found to be an excellent weapons system for air-to-air combat. Several deficiencies were noted, but the F-15 Program Office has since corrected them. Test estimates of reliability/ maintainability indicated that the F-15A will be malfunction free on 20 percent of the sorties and generally have the capability to turn for a second mission 50 percent of the time. The manpower requirements necessary to support a 72 aircraft wing were estimated at approximately 1000 authorizations.

(U) In addition to the above testing, an Initial Operational Test and Evaluation (IOT&E) of the F-15 Tactical Electronic Warfare System (TEWS) was conducted by the US Air Force Tactical Air Warfare Center (USAF TAWC), Eglin AFB, Florida. TEWS gives the fighter pilot an EW capability far superior to that of previous EW systems. The resources of the Armament Development and Test Center, the Naval Weapons Center, and the 6512 Test Squadron, Air Force Systems Command were used during the test. The test was conducted simultaneously with Air Force and contractor Development Test and Evaluation (DT&E) from February 1974 through October 1976. The IOT&E, Air Force directed and Air Force Test and Evaluation Center monitored, was comprised of 325 sorties. Air Force personnel performed organizational level maintenance for the F-15 TEWS. However, intermediate and depot maintenance support was accomplished entirely by contractor engineers and technicians using interim special test equipment.

(U) An IOT&E of the Overload Warning System (OWS) was conducted by the US Air Force Tactical Fighter Weapons Center (USAFTFWC), Nellis AFB, Nevada. The OWS should reduce F-15 airframe damage resulting from flight overload situations as well as permitting more effective employment of the F-15. The OWS IOT&E report was released in March 1981.

(U) The F-15 and F-16 will participate in a flight demonstration to select a derivative fighter to satisfy the TAF need for a dual role aircraft capable of operating at night and under weather. The flight demonstration will begin mid 1982 and be completed by July 1983. AFTEC will manage the operational utility evaluation (OUE) portion of the flight demonstration.

Budget Activity: Tactical Programs #4

Program Element: 27130F F-15 Squadrons

OT&E Reports

1. F-15A IOT&E Final Report
2. F-15A FOT&E Final Report, August 1976
3. F-15 Verification T&E in Europe, July 1977
4. F-15 Tactical Electronic Warning System, December 1979
5. F-15 Overload Warning System, March 1981

3. Systems Characteristics:

The F-15 is an advanced tactical fighter developed for the air superiority mission. It is a twin engine, single place, fixed swept wing airplane characterized by high thrust-to-weight and low wing loading for superior acceleration and maneuverability. The F-15 is equipped with a balanced mix of air-to-air weapons, ranging from medium range all-weather missiles to rapidfire 20mm cannon and provides an outstanding capability against the postulated enemy air threat.

A. Operational	DEVELOPMENT ESTIMATE	DEMONSTRATED PERFORMANCE
1. Max Mach No @ Altitude (Sustained/Burst)	2.3/2.5	2.3/2.5
2. Max Mach No @ Sea Level (Sustained)	1.2	1.16
3. Design Maximum Load Factor (80% Internal Fuel), g	7.33	7.33
4. Maximum Buffet-Free Maneuver g (0.8M, 30K ft), g		
5. Energy Maneuverability (Ps), fps		
a. 0.9M, 30,000 ft, 5g, Mil Pwr		
b. 0.6M, 10,000 ft, 5g, Max Pwr		
c. 0.9M, 10,000 ft, 1g, Max Pwr		
d. 0.9M, 10,000 ft, 5g, Max Pwr		
e. 0.9M, 30,000 ft, 5g, Max Pwr		
f. 0.9M, 35,000 ft, 5g, Max Pwr		

Budget Activity: Tactical Programs #4

Program Element: 27130F F-15 Squadrons

B. Technical

	DEVELOPMENT ESTIMATE	DEMONSTRATED PERFORMANCE
1. Design Mission Take-off Wt, lb	40,000	41,491
2. Take-off Wing Loading, lb/ft	66	68
3. Uninstalled Thrust-to-Take-off Weight Ratio	1.17	1.15

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #27131F (64225F)   Title: A-10 Squadrons
DOD Mission Area: #223 - Close Air Support/Battlefield Interdiction   Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	16,549	5,000	2,716	2,694	2,773	491,885

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The A-10 is a single seat aircraft specifically designed for the Close Air Support (CAS) mission. High survivability is a primary design feature. It has a high velocity, rapid fire, 30 millimeter(mm) gun for increased target kill effectiveness and can carry a large and variable external load of conventional ordnance. The A-10 is designed to operate in the European threat environment and its primary mission is to attack targets in close proximity to friendly forces in support of the ground battle.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in Thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional To Completion	Total Estimated Costs
RDT&E	13,947	6,488	4,845		5,776	493,852
Procurement (Aircraft) 1/	235,900	360,700	0		0	4,940,500
(Quantity)	(20)	(20)2/	0		0	(727)2/

$2.5M RDT&E funds were added in FY 1982 to expand investigation of improvements for potential avionics enhancements for integration of LANTIRN. The FY 1983 RDT&E reduction of $1.488M was the result of Congressional action in the FY 83 Defense Authorization Bill. Both the FY 1983 and the Air Force FY 1984 reductions delete funding for the two-seat A-10B development. FY 1982 procurement increase of $4.3M is for initial spares while the FY 1983 reduction of $323.7M reflects congressional action which did not authorize A-10s.

4. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Costs
Procurement (Aircraft) 1/	240,200	289,100 3/	0	0	0	4,588,900
(Quantity)	(20)	0				(707)

1/ Includes initial spares   2/ Includes 14 two-seat A-10B trainer aircraft

3/ Versus $29.0M authorized

Program Element: #27131F | Title: A-10 Squadrons
DOD Mission Area: #223 - Close Air Support/Battlefield Interdiction | Budget Activity: #4 - Tactical Programs

5. (U) RELATED ACTIVITIES: The A-10 utilizes the General Electric TF34-100 engine which is a modification of the TF34-400 engine developed by the Navy for the S-3A (Anti-Submarine Warfare Aircraft), Program Element (PE) 24215N. The TF34-100 engine was developed by the Air Force for A-10 application and includes several cost saving features. The A-10 Program Office and Navy have worked closely to ensure a high degree of commonality between both engine models. The A-10 is the first weapon system to use the GAU-8 30mm gun system, developed under PE 64605F. The A-10 Program Office had overall management responsibility for the GAU-8; however, the gun program was transferred to Warner-Robins Air Logistics Center, Robins AFB, Ga. Sacramento Air Logistics Center, McClellan AFB, Ca, now has overall program management responsibility for the A-10 program. The cost of the gun development as related to integration and testing with the A-10 is borne by the A-10 element. The A-10 also employs the Maverick AGM-65 (Tactical Air-to-Ground Missile), PE 27313F. Weapon System Trainers for the A-10 were developed in PE 64227F. The Standard Inertial Navigation System, developed under PE 64201F, is being installed in the A-10. The $14.9M for PE 64201F is not shown in the A-10 RDT&E although the A-10 Selected Acquisition Report has included these costs in the A-10 Development. The Low Altitude Navigation and Targeting Infrared System for Night (LANTIRN) being developed under PE 64249F is planned for integration on the A-10 by a Class V Aircraft Modification.

6. (U) WORK PERFORMED BY: The A-10 production program is managed by the A-10 System Program Office, Aeronautical Systems Division, Wright-Patterson Air Force Base, OH. The prime contractor for the A-10 is Fairchild Republic Company, Farmingdale, L.I., NY. The GAU-8 30mm gun contractor is General Electric, Burlington, VT. The TF34-100 engine is managed by the San Antonio Air Logistics Center, Kelly AFB, TX. The engine contractor is General Electric, Lynn, MA.

7. (U) A-10 Squadron (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984)

A. (U) Project Description: The A-10 RDT&E program now provides minimum sustaining flight test, laboratory and engineering support to resolve service revealed problems, improve the environmental control system and evaluate potential avionics enhancements to increase effectiveness and survivability in night/low altitude environments, such as Low Altitude Navigation and Targeting Infrared Systems for Night (LANTIRN).

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: In FY 1982, development and testing of a device to prevent excessive gun gases from entering the engine was completed and the procurement of retrofit kits initiated. Flight testing to evaluate potential avionics enhancements to increase effectiveness in night/low altitude environments was conducted. The development of the two-seat A-10B continued during FY 1982.

(2) (U) FY 1983 Program: The development of the two-seat A-10B continued during FY 1982 but was not extended into FY 1983 due to Congressional actions in the FY 1983 Authorization deleting the FY 1983 procurement and reducing the FY 1983 RDT&E. The FY 1983 RDT&E efforts will continue minimum support for resolving service problems and evaluating avionics improvements to increase the A-10's effectiveness as the threat continues to change. Preliminary development efforts for integration of unique A-10/LANTIRN interfaces will also be conducted.

Program Element: #27131F Title: A-10 Squadrons
DOD Mission Area: #223 - Close Air Support/Battlefield Interdiction Budget Activity: #4 - Tactical Programs

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The FY 1984 RDT&E efforts will continue minimum support for resolving service problems and evaluating avionics improvements to increase the A-10's effectiveness as the threat continues to change. Development efforts for integration of unique A-10/LANTIRN interfaces will be continue Preliminary efforts for integration of ALR-74, improved gun sight, low altitude warning system, AIM-9L integration and infrared countermeasures will also be conducted.

(4) (U) Program to Completion: The RDT&E efforts will continue minimum support for resolving service problems and evaluating avionics improvements to increase the A-10's effectiveness as the threat continues to change. Development efforts for integration of unique A-10/LANTIRN interfaces will be continued.

C. (U) Major Milestones:

	Milestones		Dates
(1)	Award full-scale dev/prod contract		Mar 1973
(2)	Critical Design Review		May 1974
(3)	Complete GAU-8/A prototype demonstration		May 1974
(4)	Production Readiness Review		May 1974
(5)	DSARC IIIA & long lead production release		Jul 1974
(6)	Engine Qualification Test Complete		Oct 1974
(7)	First flight DT&E aircraft		Feb 1975
(8)	Fatigue test one lifetime complete		Oct 1975
(9)	First Single-Seat Production Aircraft Delivery		Nov 1975
(10)	DSARC IIIB major production decision		Feb 1976
(11)	Initial Operational Capability		Oct 1977
(12)	Activate USAFE Base		Jan 1979
(13)	First Two-Seat Production Aircraft Delivery	*(Apr 1984)	Deleted
(14)	Complete Follow-on Development Program		Sep 1986

* Date presented in Fiscal Year 1983 Descriptive Summary

(U) Explanation of Milestone Changes

(13) Delivery of two-seat aircraft has been deleted as a result of the FY 83 Authorization Bill which cancelled the production of 6 A-10As and 14 A-10Bs in FY 83.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable

Budget Activity: Tactical Programs, #4
Program Element: #27131F (64225?), A-10 Squadrons

Test and Evaluation Data

1. (U) Development Test and Evaluation: In 1966, the Chief of Staff of the Air Force directed that action be taken to develop a new aircraft specialized for the Close Air Support (CAS) mission. This direction reflected the need for an aircraft which would replace aging or less effective aircraft used in CAS and to provide optimum CAS at least cost. This requirement still exists and is being satisfied by the A-10. The development of the A-10 was initiated, using a competitive prototype approach, with "design-to-cost" management goals. On 28 February 1973, the Department of Defense approved the development of the A-10 and the Air Force Systems Command awarded contracts to Fairchild Republic Company (airframe) and General Electric Company (TF34 engine) for this effort.

(U) An extensive review of the A-10 program was accomplished in July 1974 to determine if the A-10 was ready to enter low rate production. A detailed assessment of the test program and a review of the A-10's production readiness posture were made. The results of this review culminated in the approval to procure 52 A-10 production aircraft.

(U) The TF34-100 engine completed qualification testing in October 1974. Continued testing of the two prototype aircraft until June 1975 supported the development program. Six Development Test and Evaluation (DT&E) aircraft were delivered in February 1975. These aircraft were used to test the following areas: aerodynamics, performance, freedom from flutter, 100 percent air loads, armament systems, subsystems, climatic/adverse weather testing and initial operational tests. The performance thresholds were met or exceeded with the exception of forward airstrip takeoff and landing distance. These parameter values were assessed and found to have little impact on the A-10's operational utility. All major test milestones required prior to the full rate production decision were accomplished. The bomb and strafe accuracy tests demonstrated the A-10's excellent weapon delivery capability. The A-10 technical risks were minimized prior to production go ahead.

(U) The static test article has successfully demonstrated freedom from permanent deformation at design limit load and the ability to withstand ultimate strength (1.5 times limit load). The A-10 was certified to 6000 hours service life in May 1976; however, current operational usage is more severe than originally forecast resulting in a service life of 4300 hours. The cold working of approximately 1400 fastener holes in the center wing section is required to achieve at least 6000 hours based on the current, more severe operational usage. Three fatigue test failures following the certification confirmed the cold work of the fastener holes in the center wing section and resulted in a decision to thicken the outer wing section skin panels to extend the wing life to 8000 hours. A wing only fatigue test resumed in March 1982 with one side representing the thicker production wing and the other side the thicker retrofit wing. This testing will validate an 8000 hour service life with the more severe operational usage.

(U) In June 1978 and again in the summer of 1979, engine rollbacks during gunfiring were experienced. An extensive flight test investigation was initiated and interim and permanent solutions are being developed. The interim solution provides continuous engine ignition whenever the gun is fired. Continuous engine ignition and

Budget Activity: Tactical Programs, #4
Program Element: #27131F (64225F), A-10 Squadrons

regularly scheduled engine water washings have eliminated engine disturbances during gunfiring. Several solutions which divert hot gun gases away from the engine were tested. The final selection of one solution for incorporation on all A-10s is a Battelle design which attaches to the end of the barrels.

(U) Follow-on Development Test and Evaluation (DT&E) testing of selected enhancements (internal chaff/flare, interial navigation system, improved radar warning and night/low altitude avionics) is now in progress. The RDT&E aircraft have been modified to a logistics supportable configuration. These aircraft will be used within Air Force Systems Command for follow-on testing requiring the use of A-10 testbed aircraft.

(U) In August 1981, DT&E testing began on the development of the two-seat trainer aircraft which will be designated the A-10B. Preliminary testing will determine the height of the vertical tail to maintain the same handling characteristics as the single-seat A-10A. The DT&E will continue with the first production A-10B.

(U) The following A-10 Development Test Reports have been published:

AFFTC-TR-75-30, Stall/Post-Stall/Spin Avoidance Tests of the YA-10 Aircraft, September 1975.
AFFTC-TR-77-2, AF DT&E A-10A Store Certification Tests, February 1977.
AFFTC-TR-77-11, A-10A Flying Qualities Air Force Development Test and Evaluation, September 1977; Addendum I, July 1979.
AFFTC-TR-78-2, A-10A Thunderbolt II Performance Evaluation, June 1978.
AFFTC-TR-78-3 Test and Evaluation of an Emergency Arresting Hook for the A-10A, March 78.
AFFTC-TR-78-16 A-10A Flare/Chaff Limited Performance and Flying Qualities Evaluation, September 1978.

2. (U) Operational Test and Evaluation: Phase I Initial Operational Test and Evaluation (IOT&E) of the A-10 was conducted in conjunction with DT&E of the prototype YA-10 aircraft from March 1973 through June 1975. Phase II IOT&E, using six preproduction aircraft and later three production aircraft, began in April 1975 and was completed in March 1976. Limited aircraft availability prohibited evaluation of multiship employment concepts and tactics; however, adequate data were available to make an assessment of the A-10A aircraft.

(U) The combined Development Test and Evaluation/Initial Operational Test and Evaluation (DT&E/IOT&E) for the preproduction aircraft was conducted at the Edwards AFB, George AFB, and Nellis AFB ranges. An Air Force Test and Evaluation Center (AFTEC) test team composed of personnel from AFTEC, Tactical Air Command Air Force Logistics Command, and Air Training Command conducted the IOT&E portion of the test. The purpose of the IOT&E was to evaluate the operational suitability and operational effectivenes of the A-10 preproduction aircraft. Missions were flown to evaluate the aircraft, airborne performance, and handling qualities; pilot workload; air refueling capability; weapons delivery accuracy; defensive combat maneuvering capability; and night/weather operations. In addition,

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the close air support missions (support of troops, convoy escort, preparatory attacks, armed reconnaissance and combat search and rescue) were evaluated. The interface of the GAU-8 gun with the A-10 was a primary objective. Data were gathered and analyzed to evaluate the A-10 survivability, reliability, maintainability logistic supportability and maintenance training requirements.

(U) Follow-on Operational Test and Evaluation (FOT&E) was accomplished in two phases. Phase I, conducted by AFTEC and the 355th Tactical Fighter Wing, commenced in August 1976 and was completed in February 1977. This phase involved six production aircraft flying 388 sorties. Test location was Davis-Monthan AFB with deployments to Nellis AFB and McChord AFB for accomplishment of surge and low visibility test objectives. Based on the results of phase I FOT&E, AFTEC concluded that the production A-10A could perform the close air support mission better than any existing aircraft in the USAF inventory. Although some aircraft performance thresholds were missed, the overall performance was satisfactory in the context of tailoring loads and tactics to the specific missions. Primary weapons include the AGM-65 Maverick missiles and the 30mm gun. The 30mm gun is a superior weapon when attacking current and projected Warsaw Pact front line armor. Excellent accuracy is achieved even when firing beyond 4000 feet slant range.

(U) Lack of sophisticated avionics has relegated the aircraft to daytime usage in a high threat environment. With low altitude target ingress, dead reckoning navigation causes an excessive pilot workload. Therefore, an inertial navigational system (INS) is needed. An INS was introduced in production aircraft number 431. A retrofit program for all A-10 aircraft has been approved and Kits are being procured. In the low ceiling/visibility environment, the aircraft's capability to attack small passive targets is unmatched by any other aircraft in the inventory.

(U) The A-10A is well suited to forward operating location operations. Medium weight takeoffs and landings resulted in average distances of 2175 feet and 1600 feet respectively. The simplicity of the aircraft and the self-contained power unit combine to aid in quick and safe turnaround operations.

(U) Aircraft reliability, as measured by Mean Time Between Failure (MTBF) was excellent. The MTBF of 1.8 hours was better than the predicted value of 1.34 and the Decision Coordinating Paper number of 1.78. Maintainability as measured in maintenance man-hours per flying hour (MMH/FH), closely approximated the predicted value of 26.0 MMH/FH. Availability was also satisfactory with the flyable rate slightly below the prediction of 61 percent.

(U) Major deficiencies identified during the test were inadequate stability augmentation, unsatisfactory night lighting, and a limited use head-up display (HUD). The first two deficiencies have been corrected, and work is continuing on the HUD. The above information is from the phase I Follow-on Operational Test and Evaluation (FOT&E) final report, May 1977. The HUD deficiency has now been corrected.

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(U) Phase II Follow-on Operational Test and Evaluation (FOT&E), conducted by Tactical Air Command and the 354th Tactical Fighter Wing using operational squadron aircraft, began in January 1978 and terminated in June 1978. FOT&E was conducted at Myrtle Beach AFB, SC, and Savannah Airport, GA. The objectives of phase II FOT&E were to verify the data gathered during phase I as applied to an operational squadron and to document the A-10 weapon system capability when employed in squadron strength operating from both a permanent base and deployed in forward operational locations. This latter objective included the operation under normal and surge sortie rates.

(U) Aircraft availability was very good during the test, especially in view of system maturity. Reliability and maintainability were very good. Phase II test values were 21.78 maintenance manhours per flying hour and a Mean Time Between Failure of 4.47 hours; predicted values were 21.00 and 1.78, respectively. Aircrew training requirements were completed with relative ease due to aircraft availability. Logistics supportability revealed initial spares supply level deficiencies concerning engine related items, and provisions were made to correct the situation. All operational effectiveness objectives were met. The 24 primary aircraft authorized A-10 squadron with its mobility support package showed an excellent capability to mobilize, deploy, and perform its mission under normal and surge sorties from both a fixed base and deployed forward operating locations.

(U) The phase II Follow-on Operational Test and Evaluation (FOT&E) report, July 1979, concluded that A-10 availability, from either a main operating base or a forward operation location, was excellent. Weapon system reliability and maintainability were satisfactory during the evaluation. The deficiencies encountered in the test consisted of inadequate technical data, an unreliable aircraft boarding ladder, and the unavailability of the GAU-8 automatic loading assembly. All of these deficiencies are being corrected.

(U) The A-10 was the first aircraft to receive the Air Force's Standard Medium Accuracy Inertial Navigation System (INS). The INS FOT&E was completed in September 1981 and demonstrated accuracies within the specifications. The new INS was included in production aircraft beginning with aircraft No. 431 (November 1980). Retrofit of the INS is scheduled to begin in CY 84.

(U) Published OT&E reports include:

A-10A IOT&E Phase I Final Report, November 1975.
A-10A IOT&E Phase II Final Report, May 1976.
A-10A FOT&E Phase I Final Report, May 1977.
A-10A FOT&E Phase II Final Report, July 1979.

3. (U) System Characteristics:

The significant A-10 performance parameters are shown below.

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CHARACTERISTIC	DEVELOPMENT ESTIMATE	DEMONSTRATED PERFORMANCE
- Cruise Speed (KTAS)	300	342
- Forward Airstrip 1/		
Take-off (ft)	1200	1900
Landing (ft)	1200	1460
- Loiter at 250 NM Radius (hr)		
Close Air Support Mission	2.0 2/	1.8 3/
Anti-Armor 4/	-	1.8 5/
- Bombing Accuracy, MK-82		
(CEP)(mils)	15	13.6 6/
- Strafing Accuracy (CEP)(mils)	10	4
- Sustained Load Factor 2/		
at 275 Kt (g)	3.5	3.2
at 150 Kt (g)	2.2	2.0

(U) NOTE: All values for tropic day conditions.

1/ (U) 4 MK82, 750 rounds of 30mm ammunition and fuel for 50 NM cruise to target, 30 minute loiter, combat, 150NM return to base, and land with fuel reserve
2/ (U) 18 MK82, 750 rounds of 30mm ammunition, and fuel for combat and land with fuel reserve
3/ (U) 16 MK82, 750 rounds of 30mm ammunition, and fuel for combat and land with fuel reserve
4/ (U) 6 Mavericks, 1350 rounds of 30mm ammunition, two ECM pods, full chaff/flare system, same mission profile as CAS mission
5/ (U) Estimated
6/ (U) 6 MK82, 750 rounds of 30mm ammunition, fuel for 300 NM, land with fuel reserve

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #27132F
DOD Mission Area: #221 - Counter Air

Title: Derivative Fighter
Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT 1/	-	-	104,712	159,507	184,810	449,029

1/ Funds programmed in F-15 (PE 27130F) and F-16 (PE 27133F) for Derivative Fighter evaluation and flight test, not included in total estimated cost, are $18,000 in FY 1982 and $24,000 in FY 1983.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Derivative Fighter program was established to ensure the F-15 and F-16 aircraft retain their capability to counter the numerically superior and increasingly sophisticated threat. As the F-15 and F-16 aircraft will form the backbone of our fighter force structure until our next generation fighter, the Advanced Tactical Fighter (ATF), enters the inventory in the early 1990's, their combat capability must continue to be enhanced through rational and evolutionary improvements. Derivatives of the F-15 and F-16 offer significant improvements in range, payload and the ability to operate at night and in weather on interdiction missions while retaining their capability to perform the all-weather, air superiority mission.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands) Not Applicable.

4. (U) OTHER APPROPRIATIONS FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Procurement (Aircraft)	0	0	21,400	76,100	5,025,200*	5,122,700
(Quantity)	(0)	(0)	(0)	(2)	(TBD)	(TBD)

* Includes contingent procurement of additional fighter aircraft in FY 87 and 88. Derivative Fighter total estimated cost is $2.3 billion.

5. (U) RELATED ACTIVITIES: The Derivative Fighters will be based on the F-15C/D developed under Program Element (PE) 27130F and the F-16C/D/XL prototype under PE 27133F. The funds for the first two years of the evaluation and demonstration flight testing for the Derivative Fighter were approved in these program elements. The Derivative Fighter(s) will incorporate incremental capability levels of improvements to provide enhanced air-to-surface capability. Levels of improvements being considered include use of the Maverick AGM-65 (Tactical Air-to-Ground Missile), PE 27313F and the Low Altitude Navigation and Targeting Infrared System for Night (LANTIRN) being developed under PE 63219F. A Derivative Fighter Steering Group (DFSG) has been established in Air Force Systems Command to coordinate the formulation and evaluation of incremental levels of capability improvement. The DFSG is working jointly with the Tactical Air Command in conducting the design, technical, operational, and affordability evaluation of the Derivative Fighters.

Program Element: #27132F
DOD Mission Area: #221 - Counter Air

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6. (U) WORK PERFORMED BY: The Derivative Fighter evaluation program is managed by the Derivative Fighter Steering Group, Aeronautical Systems Division, Wright-Patterson Air Force Base, OH. Beginning in FY 84, the Derivative Fighter Program will be managed by the F-15 and F-16 System Program Offices as appropriate. The prime contractor for the F-15 is McDonnell Douglas Company, St Louis, MO. General Dynamics Corporation, Ft Worth, TX is the prime contractor for the F-16. The F100 engine contractor is Pratt and Whitney Company, East Hartford, CT.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not applicable

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

A. (U) Project Description: The Derivative Fighter program will incorporate pre-planned product improvements (P^3I) for the F-15 and/or the F-16 to increase range, payload and night/in weather capabilities for interdiction missions while retaining their air superiority capability.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The flight test demonstration of the F-15 and F-16XL began in FY 82. These efforts were funded in the respective F-15 and F-16 program elements. The F-16XL-1, powered by the P&W F100 engine, achieved first flight and the testing of both the F-15 and F-16XL is continuing.

(2) (U) FY 1983 Program: The flight test demonstration will continue on two F-16XL and three F-15 aircraft. The second F-16XL is flying with the F110 (formerly F101DFE) engine, built by General Electric, Cincinnati, Ohio. A design, technical, operational and affordability evaluation of incremental levels of improvement will be conducted. The evaluation will be complete in late FY 83 and the results provided to Congress in support of the FY 84 congressional hearings. All FY 83 efforts are funded in the respective F-15 and F-16 program elements.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The development of the selected incremental levels of capability improvement will be initiated on the F-15 and/or F-16. The FY 84 program will be dependent on decisions made in late FY 83. Potential evolutionary enhancements to the F-15 being considered include integration of improved radar modes, avionics/armament to exploit air-to-surface capabilities and integration/missionization of rear cockpit controls/displays. Potential evolutionary enhancements being considered for the F-16 include the cranked arrow wing, missionized rear cockpit, avionics/armament to exploit air-to-surface capabilities and derivative peculiar support systems.

C. (U) Major Milestones:

Milestones	
Results of Evaluation to Congress	Jul/Aug 83
Initiate development of P^3I Mods	Oct 83
1st Production Delivery	TBD

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #27133F
DOD Mission Area: #223, Close Air Support and Interdiction

Title: F-16 Squadrons
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	57,284	73,486	107,395	72,832	71,889	1,281,602
2671	F-16A-D	42,000	62,444	98,895	57,032	67,889	1,226,976
2835	F-16 Derivative*	15,284	11,042	-	-	-	26,326
2970	PLSS VNS	-	-	8,500	15,800	4,000	28,300

*Funded in PE 27132, Fighter Derivative, Beginning in FY 84

2. (U) BRIEF DESCRIPTION OF PROGRAM ELEMENT AND MISSION NEED: This program will satisfy mission need for a lightweight, high performance, multimission fighter capable of performing a broad spectrum of tactical air warfare tasks at an affordable cost. The F-16 is designed for high sortie rates with rapid turnaround, minimum manpower/logistics burden, and exceptional air combat maneuvering performance coupled with a potent air-to-surface weapons delivery capability. The F-16 will replace aging F-4s in the active inventory as well as modernize the Reserve Forces.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($'in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
RDT&E	57,284	86,142	220,202		680,300	1,941,385
Procurement (Aircraft)*	2,273,000	2,225,900	2,108,700		25,685,200	38,962,600
(Quantity)	(120)	(120)	(120)		(1020)	(1985)

* (U) Includes weapon system and initial spares.

(U) The FY 1983 RDT&E reduction is a result of Congressional actions: -$10M for the F-16 derivative fighter prototype demonstration; -$2.5M for MSIP; and -$0.1M undistributed cut. The FY 1984 RDT&E reduction ($112.8M) reflects the transfer of the gear type fuel pump development to PE 64223F (-$13.4M), the transfer of derivative fighter development to PE 27132F (-$129.3M), the reduction in MSIP retrofit kit development (-$14.8M) and an inflation adjustment of -$2.8M. These reductions are partially offset by increases in FY 1984 to the improved radar program (+$2.4M) to reflect the Westinghouse Phase II development contract at ceiling; addition of MSIP interim contractor support (+$2.0M); an increase to the flight test and mission support (+$1.7M); and an increase in the FY 1984 estimate for General Dynamics

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over target (+$3.3M) resulting from a rephasing of these costs from prior years. The funds made available in prior years by this rephasing were used for the improved radar development which exceeded the original estimate. In addition, the development of the vehicle navigation subsystem (VNS) (+$8.5M), auto terrain avoidance (TA) (+$17.5M) and monopulse integration (+$11.2M) have been added in FY 1984. The FY 1985/ to complete estimate reflects the transfer of the derivative fighter development to PE 27132F ; the transfer of the gear pump development to PE 64223F; the addition of VNS, auto TA, and monopulse integration; minor changes in flight test and mission support funding; and an inflation adjustment. The FY 1984 Procurement increase is a combination of minor program repricing, increased estimate for initial spares, rephasing of peculiar support, inflation adjustments, added funds to support an engine competition and an addition of industrial preparedness funds for a surge in engine production. The FY 1985/to complete estimate reflects the addition of 180 aircraft in FY 1991 increasing the total procurement from 1985 to 2165; added funds for an engine competition; and the deletion of funds for a derivative fighter configuration.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1981 & Prior	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Aircraft Procurement*	6669.2	2,231,100	2,246,600	2,123,600	3,164,500	25,777,500	42,212,500
Quantities**		(120)	(120)	(120)	(120)	(1080)	(2165)

*(U) Includes weapon system and initial spares.

**(U) The procurement estimate of 2165 F-16A/B/C/D aircraft includes 180 aircraft to be procured in FY 1991 not reflected in the FY 1983 President's Budget. Balanced procurement of F-15s and F-16s will continue until availability of the advanced tactical fighter (ATF) is assured.

5. (U) RELATED ACTIVITIES: The following program elements contain development efforts which are applicable to the F-16: PE 64602F, Armament/Ordnance Development (30mm gun pod, Multiple Stores Ejector Rack); PE 64314F/27163F, Advanced Medium Range Air-to-Air Missile; PE 63249F, Night Attack Program; PE 64249, Night/Precision Attack, (Low Altitude Navigation and Target Infrared System for Night); PE 64725 Aircraft Identification System (Combat Identification System); PE 64201F, Aircraft Avionics Equipment Development (Project 2519, Radar Programmable Signal Processor); PE 64218F Engine Model Derivative Program; PE 64737F, Airborne Self Protection Jammer; PE 27423F, Advanced Communication Systems and PE 64778/35164, Global Positioning System; PE 64268F, Component Improvement Program, funds improvements for the F100 engine which is used in both the F-16 and F-15; PE 64223 Alternate Fighter Engine, PE 64742F/27244F, Precision Location Strike Systems; PE 64607F, Wide Area Antiarmor Munitions (WAAM); and PE 63742 Combat Identification Technology.

6. (U) WORK PERFORMED BY: The F-16 Program Office of the Aeronautical Systems Division, Wright-Patterson Air Force Base OH, has management responsibility for the F-16 program. The major contractors are General Dynamics, Fort Worth, TX - F-16 airframe; Pratt & Whitney, East Hartford, CT - engine; Westinghouse, Baltimore, MD - radar; and Singer Kearfott, Little Falls, NJ - inertial navigation set. Major United States subcontractors include Bendix, South Bend,

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IN - unified fuel control; Sundstrand Aviation, Rockford, IL - starter and constant speed drive; Delco Electronics, Goleta, CA - fire control computer; Menasco Manufacturing, Fort Worth, TX - landing gear; Hamilton Standard, Windsor Locks, CT - augmentor fuel pump, electronic engine control; and Air Research Manufacturing, Torrance, CA - flap drive and emergency power unit; Lockheed Missile & Space - VNS development. In addition to these, there are over 4,000 other subcontractors and suppliers in the United States. Major European manufacturers include Fabrique Nationale, Belgium - engine; SABCA/SONACA, Belgium assembly; FOKKER, The Netherlands center fuselage and assembly; Per Udsen, Denmark - pylons and vertical fin; Kongsberg Vapenfabrikk, Norway - inertial navigation set, fan drive; and Marconi-Elliott, England - head-up display. Over 40 items are currently being produced in Europe.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: PLSS VNS (Single Project less than $10 million in FY 1984)

A. (U) Project Description: This project develops the vehicle navigation subsystem (VNS) for the F-16 inorder to interface with, and to use inputs from the Precision Location Strike System (PLSS). PLSS, through the VNS, will provide the F-16 pilot with precise target location, navigation guidance to the target, and information on enemy defenses both enroute and in the target area. Following attack, damage assessment information can be relayed back to the PLSS network through the VNS.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: N/A

(2) (U) FY 1983 Program: This effort was identified as part of the PLSS program (PE 64742/27244) in the FY 1983 request but has been eliminated from that program element at Congressional direction.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: This project is a continuation of the VNS effort initated under the PLSS Program. The FY 1984 effort ($8.5M) will continue development of Group A and Group B equipment including the antenna, amplifier, and PLSS interface unit.

(4) (U) Program to Completion: The FY 1985 effort ($15.8M) will continue equipment development, and initiate system integration tests and flight tests. Flight test will begin in FY 1986 ($4.0M) with initial production late in FY 1986. The program is being restructured as a result of the schedule delay.

C. (U) Major Milestones:

(1) (U) Initiate Group A/Group B equipment	Oct 82
(2) (U) Systems Integration	2nd Qrt/85
(3) (U) Flight Tests	1st Qrt/86
(4) (U) Production Incorporation	FY 86

Program Element: #27133F
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Title: F-16 Squadrons
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8. (U) SINGLE PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: #2671, F-16 A-D

A. (U) Project Description: This project has provided the development of the F-16 aircraft from its origin in the Lightweight Fighter prototype program in the early 1970's to the fighter aircraft currently in production and being deployed in USAF tactical air forces (TAC/USAFE/PACAF) as well as the air forces of seven other countries around the world. Continued flight test is provided for the airframe, engine, aircraft subsystems and store certification, and development effort addresses increased F-16 capability to meet the quantitative and expanding qualitative threat. Effort currently underway includes radar improvements required for use of BVR missiles and enhanced electronic counter measures (ECM); and the integration of the AMRAAM missile.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The FY 1982 RDT&E funds ($42.0M) were used to continue the programmable signal processor (PSP)/dual mode transmitter (DMT) radar improvement effort ($26.2M) and initiated flight test of the hardware (December 1981), and continued air vehicle/engine updates, flight testing including stores certification and management/engineering support ($15.8M). Primary air vehicle update efforts include avionics software improvements, improved handling qualities and resolution of engine icing problems. Phase I of the radar improvement effort was completed. Funding for procurement of 120 aircraft was in the FY 1982 Budget. The procurement plan specifies a multiyear procurement strategy for a 120 aircraft per year production rate with a 480 total aircraft buy during FY 1982-1985. The multiyear procurement program should result in an estimated $259.5 million savings over annual procurement of 480 aircraft. Follow-on coproduction efforts were negotiated with The Netherlands; and Pakistan, Korea and Venezuela signed agreements with the United States to purchase 40, 36 and 24 aircraft, respectively.

(2) (U) FY 1983 Program: The FY 1983 RDT&E funds ($62.4M) will be used to continue the PSP/DMT radar improvement development and hardware flight test ($18.8M), to initiate F-16/AMRAAM integration ($10.9M), and to continue follow-on development efforts (air vehicle/engine updates, flight testing to include stores certification, and management/engineering support ($22.7M)). Initial development of a gear type main fuel pump for the F100-PW-200 engine will start in FY 1983 to enhance pump reliability ($10.0M). Also in FY 1983, AFTEC will initiate operational testing of the Multinational Staged Improvement Plan (MSIP) Stage II configured F-16 emphasizing testing of the improved radar. The FY 1983 procurement request funds 120 F-16 aircraft within the FY 1982-1985 multiyear procurement program. The last half of the FY 1983 procurement (60 aircraft) is scheduled to be the MSIP Stage II configuration (aircraft No. 786 and on) and will be designated the F-16C/D.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The FY 1984 RDT&E program will continue to support follow-on test requirements for equipment upgrades and identified deficiencies, and will continue development of previously initiated efforts. Major efforts will continue to focus on the radar development and integration of the Advanced Medium Range Air-to-Air Missile (AMRAAM). Cost estimates are based on annual "Grass Roots" program office estimating procedures. Funding ($98.9M) will be used for improved radar follow-on development ($11.2M); F-16/AMRAAM integration ($30.4M); air vehicle update/management support/engineering support/flight testing ($18.6M); development of retrofit kits for air defense F-16s ($10M), development of auto TA (+$17.5M); and integration

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of monopulse capability (+$11.2M). The improved radar will be introduced in production with the first F-16C aircraft in July 1984 with rate production of the F-16C/D in March 1985. The FY 1984 radar effort will complete the development of enhanced radar modes and improved electronic counter measures. The AMRAAM integration includes software development and final Group A development to meet production incorporation of AMRAAM capability in Oct 1985. Retrofit kits for the 132 air defense aircraft will give those aircraft AMRAAM capability against single targets consistent with the capability of the Block 15 radar. The transfer of the air defense aircraft to the Air National Guard will begin in 1987 with the phase out of F-106 interceptors. The planned FY 1984 procurement request will be for 120 aircraft to bring the total procured through FY 1984 under the four year/480 aircraft multiyear procurement to 360 aircraft; all of the FY 1984 aircraft will be the F-16C/D configuration; Follow-on multiyear procurement plans will be addressed in the FY 1985 budget.

(4) (U) Program to Completion: This is a continuing program. The FY 1985-1988 RDT&E funding ($144.7M) for the F-16 A-D will be used to complete development of the improved radar ($1.2M); to complete integration of AMRAAM ($12.8M) and continued air vehicle update, management support, engineering support, stores certification and flight testing. The RDT&E program for FY 85/to complete has grown $64.2M between the FY 83 and FY 84 budget submissions. Major additions include the addition of FY 88 funds to provide continued engineering support (+$11.6M); the addition of the IFF flight test program in FY 85 (+$5.7M); the addition of MSIP retrofit kit development in FY 86 ($26.9M); and the development of auto TA and monopulse integration in FY 85/86 (+$32.1M). Other changes include the transfer of the gear pump development (-$10.7M) to PE64223; an increase in the flight test/mission support programs (+$3.6M); and a decrease in the MSIP program in FY 85/86 (-$5.0M). Procurement will continue with 120 aircraft in FY 85 to complete the four year multiyear procurement; in FY 86, procurement will increase to 180 aircraft per year through FY 91. The differential cost for derivative aircraft has been removed and is reflected in PE27132.

C. (U) Milestones:

	Milestone	Date
A.	(U) Source Selection/Award Development Contract	Jan 1975
B.	(U) Defense Systems Acquisition Review Council (DSARC) II	Mar 1975
C.	(U) European Long Lead Funds Released	Jun 1976
D.	(U) Delivery First Full Scale Development Aircraft	Dec 1976
E.	(U) DSARC IIIA (Long Lead Release)	Jan 1977
F.	(U) DSARC IIIB (Production)	Oct 1977
G.	(U) First Aircraft to Tactical Air Command	Jan 1979
H.	(U) First European Aircraft	Jan 1979
I.	(U) Initial Operational Capability (IOC)	Oct 1980
J.	(U) Delivery of 651st Aircraft	Sep 1983
K.	(U) Delivery of Last F-16 (2165)	May 1993*

* (U) Has been extended one year with the addition of 180 aircraft in FY 1991.

Program Element: #27133F (64229F) Title: F-16 Squadrons
DOD Mission Area: Counter Air Support and Interdiction Budget Activity: Tactical Program, #4

Test and Evaluation Data

1. (U) Development Test and Evaluation: General Dynamics is the prime contractor for airframe and support equipment development and Pratt & Whitney is responsible for continued development of the F100 engine. Most of the major development testing on the basic aircraft, subsystems, and support equipment have been completed. Performance and stability and control testing indicate that the aircraft can meet design specifications and be employed effectively throughout the flight envelope. The F-16 has demonstrated that it can carry and employ a varied mix of weapons including air-to-air ordnance, air-to-surface guided missiles, conventional bombs, and nuclear weapons. The F-16 radar meets basic specifications and can be used effectively to deliver air-to-air and air-to-ground weapons. Ground testing results indicate an airframe life of at least 8,000 hours. As would be expected in any development program, there have been changes required to correct problems identified during the test program. Fixes have been designed, tested, and incorporated into the production aircraft. The last of the development aircraft was delivered in August 1978 and the first F-16 unit was activated at Hill Air Force Base, UT, in January 1979. All weather testing in desert and tropical climates is completed. Alaskan cold weather tests and an evaluation in European weather conditions were completed in early 1979. Testing to evaluate engine inlet icing problems was initiated in Calendar Year 1979 and verified the value of the heated inlet strut and engine anti-ice improvements.

(U) Future flight tests will include certification of additional weapons, continued systems integration tests, and evaluation of fixes for previously identified deficiencies. The major test activity in follow-on development will be evaluation of the enhancement of aircraft systems necessitated by threat evolution. Reliability and Maintainability (R&M) testing has been an integral part of the development effort and the F-16 currently indicates it can meet R&M goals established at program approval.

(U) A January 1980 decision by the Air Force to authorize 11 production aircraft for follow-on testing initiated a major effort by Air Force Systems Command to upgrade the F-16 test fleet. Seven aircraft will be assigned to Eglin AFB (Advanced Medium Range Air-to-Air Missile, Low Altitude Navigation Targeting Infrared Night, SEEK EAGLE, and weapons development) and four will be assigned to Air Force Flight Test Center (systems verification and follow-on structures/improvement). Current testing is provided by five (of eight original) full scale development aircraft and the first three test designated production aircraft. F-16A, No. 4, has been decommissioned and provided to the AF Academy for display. A second F-16A, No. 6, supports the control configured vehicle Advanced Fighter Technology Integration program. F-16B, No. 2, has been leased to General Dynamics for the F-16/J-79 program. Flight testing of the F-16/J-79 was conducted OctoberDecember 1980. Flight testing of the F-16/F101 (F-16A, No. 1) Derivative Fighter Engine was initiated in mid-December 1980 and was completed May 1981. The Air Force has leased F-16As, Nos. 3 and 5 to General Dynamics to support a contractor Independent Research and Development (IR&D) of an F-16 derivative prototype (F-16XL). Congress supported Air Force flight evaluation of the derivative aircraft adding FY 1982 funding to the F-16 program. First flight of the number one derivative prototype was 3 July 1982 followed by flight of the number two derivative prototype in October 1982. The No. 2 prototype incorporates the General Electric F101 derivative fighter engine for evaluation. The demonstration flight test is to validate/verify aircraft aerodynamic changes and weapon carriage/release capabilities. Flight test of the Programmable Signal Processor (PSP) Dual Mode Transmitter (DMT) APG-66 radar in a Saberliner was initiated in December 1981. The improved radar testing will continue into 1983. Other MSIP related testing (core avionics, hud, radar integration) will begin in Dec 82.

2. Operational Test and Evaluation:

a. (U) The F-16 initial operational test and evaluation (IOT&E) was conducted in conjunction with the development test and evaluation (DT&E) from December 1976 to October 1977. The IOT&E results supported a production recommendation to the Defense Systems Acquisition Review Council (DSARC) IIIB. Follow-on test and evaluation (FOT&E), Phase I, was completed in January 1979.

b. (U) The combined Development Test and Evaluation/Initial Operational Test and Evaluation (DT&E/IOT&E) was conducted primarily at Edwards AFB, CA. Other test sites were Nellis AFB, NV; China Lake NWC, CA; Alaska; El Centro NAF, CA; Yuma MCAS, AZ; Panama, CZ; and Eglin AFB, FL. An Air Force Test and Evaluation Center (AFTEC) test team composed of personnel from AFTEC, Tactical Air Command (TAC), Air Force Logistics Command (AFLC), and Air Training Command (ATC) conducted the OT&E portion of the combined tests. Test resources were incrementally increased to a total of 11 aircraft of which eight were preproduction aircraft and three were production. Additionally, a combined Air Force Systems Command (AFSC)/ AFTEC European Test and Evaluation (ET&E) with three aircraft was conducted from February to May 1979. Test sites included Bodo AFB, Norway; Skrydstrup AB, Denmark; Hahn AB, Germany; and Alconbury AB, UK.

c. (U) Follow-on Test and Evaluation (FOT&E) phase II was conducted at Hill AFB, UT, and in Europe from January 1979 through December 1980. TAC was responsible for operational effectiveness, and AFTEC further evaluated operational suitability. The AFTEC assessment included reliability and maintainability data generated by all F-16 aircraft assigned to Hill AFB, UT.

d. (U) F-16 FOT&E/Tactics Development and Evaluation (TD&E) Phase II commenced during January 1979 at Hill AFB, UT. This FOT&E/TD&E was conducted jointly by the Air Forces of Belgium, Denmark, the Netherlands, Norway, and the United States. FOT&E/ TD&E Phase II, designated the Multinational Operational Test and Evaluation (MOT&E), consisted of two parts: Part I, completed in the United States (Hill AFB) from January 1979 through June 1980, used test facilities and ranges at the following locations: Dugway/Wendover, UT; White Sands Missile Range, NM; and the Nellis Range complex in Nevada. Part II was conducted in Europe, from locations within the countries of the European Participating Air Forces (EPAF) between July and December 1980. In both parts of the MOT&E program a mix of USAF and EPAF production aircraft were used, with a maximum of 10 F-16s used as test assets during Part I and seven F-16s during Part II. TAC was responsible for the operational effectiveness and tactics development objectives; AFTEC was responsible for the suitability assessment.

Program Element: #27133F (64229F) Title: F-16 Squadrons
DOD Mission Area: Counter Air Support and Interdiction Budget Activity: Tactical Program, #4

e. (U) The purpose of the MOT&E was to refine estimates of F-16 operational effectiveness, assist in evaluation of configuration changes, develop tactics and operating concepts for F-16 employment, and assess the operational suitability of the aircraft.

f. (U) AFTEC flew 467 front seat and 98 back seat sorties during Initial Operational Test and Evaluation/Follow-on Test and Evaluation (IOT&E/FOT&E). This included six months of testing on two near-production configured full-scale development aircraft and seven aircraft-months on the first three production aircraft. OT&E included beyond visual range missions with F-4 and T-38 aircraft; operational comparisons, basic flight maneuvers and air combat maneuvers with F-4E, F-5, A-37, and T-38 aircraft; night and day air-to-surface bombing and strafe; air-to-air gunnery against towed targets; and AIM-9J/L firings against BQM-34, PQM102, and QH-50 drones. Overall weapons system performance, reliability, and maintainability estimates were rated satisfactory.

g. (U) During the European Test and Evaluation (ET&E), the F-16 was used in a wide variety of realistic operational mission scenarios to provide an early assessment of its effectiveness and suitability when operated in its intended environment. One hundred forty-two sorties were flown for an effective sortie rate of 0.78 which was well above the planned rate of 0.50. Overall F-16 performance was highly satisfactory and reliability and maintainability during ET&E were satisfactory to excellent.

h. (U) F-16 operational suitability was satisfactory during Part I MOT&E; however, adequacy of funding levels for war readiness spares kits (WRSK), F-100 engine support, and weapon system spare parts will continue to be critical to F-16 supportability in the out-years. MOT&E Part II (Europe) suitability results were highly satisfactory. With the exception of potential long-term impacts from aircraft corrosion caused by industrial pollution, F-16 operations in Europe did not produce significantly different conclusions from those drawn during Part I MOT&E.

i. (U) Current Tactical Air Command (TAC) F-16 Follow-on Test and Evaluation (FOT&E) activities are complete and reports are being prepared on the following tests:

(1) (U) Gun accuracy

(2) (U) Beacon Bombing

(3) (U) Block 15 Software Changes

(4) (U) Block 15B Radar ECCM Evaluation

j. Projected F-16 Initial Operational Test and Evaluation (IOT&E) activities include:

Program Element: #27133F (64229F)
DOD Mission Area: Counter Air Support and Interdiction

Title: F-16 Squadrons
Budget Activity: Tactical Program, #4

(1) (U) F-16 Multinational Staged Improvement Program (MSIP). Air Force Test and Evaluation Center (AFTEC) will manage the IOT&E portion of a combined Development Test and Evaluation/Operational Test and Evaluation (DT&E/OT&E) of MSIP enhancements to be conducted at Edwards AFB beginning in December 1982. Two prototype F-16C/D test aircraft will be used to evaluate the operational effectiveness and suitability of MSIP Stage II and III improvements. MSIP Stage II, now entering full scale development, will provide improved aircraft avionics as well as integration interfaces expanded computer memory, increased cooling and additional electrical power to support future growth subsystems. MSIP Stage III will provide final integration of the separately developed growth subsystems.

(2) (U) F-16 Derivative Fighter. The F-16 will participate with the F-15 in a flight demonstration to select a derivative fighter to satisfy the TAF need for a new dual role aircraft capable of operating at night and under weather. The flight demonstration started on 3 July 1982 and will be completed by July 1983. AFTEC will manage the operational utility evaluation (OUE) portion of the flight demonstration.

k. Published OT&E reports include:

(1) (U) Air Combat Fighter IOT&E Final Report, January 1978.

(2) (U) F-16 FOT&E Phase I Final Report, June 1979.

(3) (U) European Test and Evaluation Final Report Addendum F-16 FOT&E, Phase I, November 1979.

(4) (U) F-16 FOT&E Phase II Operational Suitability Final Report, October 1980.

(5) (U) F-16 MOT&E Final Report, May 1981.

(6) (U) F-16 FOT&E Phase II Operational Suitability Subsystems Evaluation Addendum, March 1981.

(7) (U) F-16 FOT&E Phase II Operational Suitability European Evaluation Addendum, April 1981.

3. (U) Systems Characteristics:

(U) Technical Information:	
(U) Length (ft)	49.5
(U) Wing Span (w/missiles) (ft)	32.8
(U) Operating Weight (empty) (lbs)	16,126 1/
(U) Internal Fuel (lbs)	6,972

Program Element: #27133F (64229F)
DOD Mission Area: Counter Air Support and Interdiction

Title: F-16 Squadrons
Budget Activity: Tactical Program, #4

(U)	Current Max Takeoff Gross Weight (lbs)	35,400
(U)	Max Payload w/Full Internal Fuel (lbs)	12,302
(U)	Engine Thrust (lbs)	23,759

1/ Projected Block II weight (aircraft #160).

(U) Performance Thresholds: (F-16 Development Concept Paper)

		Threshold	Performance Demonstrated
	Radius - Air Superiority Mission (NM)		
	Radius - Air-to-Surface Mission (NM) 1/		
	Sustained Turn Rates		
	1.2 Mach/30,000 ft (°/sec)		
	1.2 Mach/30,000 ft (G)		
	0.9 Mach/30,000 ft (°/sec)		
	0.9 Mach/30,000 ft (G)		
	Acceleration Time		
	0.9-1.6 Mach/30,000 ft (sec)		
	Max Controllable G		
	0.8 Mach/40,000 ft (G)		
(U)	Ferry Range (NM)		
(U)	Other Characteristics:		
(U)	Takeoff Distance (Air-to-Air Mission) (ft)	N/A	2200
(U)	Landing Distance (ft) (estimated)	N/A	3300
(U)	Mission Reliability (%)	90	91
(U)	Mean Flight Time Between Failure (hrs)	2.90	2.20
(U)	Radar Detection Range, 2 sq meter Target (look up/look down) (Current APG-66)	24/18	24/18

1/ Assumes maximum gross weight increased to 35,400 pounds.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #27136F
DOD Mission Area: #224 - Defense Suppression

Title: F-4G Wild Weasel Squadrons
Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982* Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	5,776	20,000	53,254	40,547	Continuing	N/A
327B	F-4G Wild Weasel Squadrons	5,776	20,000	53,254	40,547	Continuing	N/A

* Effort performed in PE 27128F, F-4 Squadrons

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The F-4G Wild Weasel represents the only lethal defense suppression weapon system in the Air Force inventory. This system is specifically designed to automatically detect, identify, locate, and destroy hostile radar emitters by the use of anti-radiation missiles, standoff guided munitions, or conventional F-4 weapons. The F-4G is classically employed in the counter-air role as an escort for the penetrating strike force or independently as a hunter-killer force against targets of opportunity. The present R&D effort is to update the capabilities of the F-4G so that it can contend with the exotic threat radars being deployed now and through the 1990's.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

F-4G Wild Weasel Squadrons	6,276	21,472	18,020	N/A	Continuing	N/A

The FY 1982 reduction was reprogramming action transferring funds to PE 64211F, Advanced Aerial Targets. Due to slip in contract award date, funds were not needed in F-4G Squadron PE. The increase in FY 1984 funds resulted from the formal bid submission from McDonnell Douglas Corporation, contract negotiations, and a reworking of the program schedule. The FY 1983 Descriptive Summary dollar figures were based on Air Force Systems Command cost estimates for the F-4G update program. The FY 1984 Descriptive Summary dollar figures are based on the R&D contract signed with McDonnell Douglas on 25 Oct 82.

Program Element: #27136F
DOD Mission Area: #224 - Defense Suppression

Title: F-4G Wild Weasel Squadrons
Budget Activity: #4 - Tactical Programs

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
AIRCRAFT PROCUREMENT: 3010	0	0	25,100	20,300	342,100	387,500

Funds listed are for the Performance Update Program (PUP) only. Other appropriations for other F-4G Squadron programs are not listed. For the total PE the "Additional to Completion" and "Total Estimated Cost" columns would read "Continuing" and "N/A" respectively.

5. (U) RELATED ACTIVITIES: Air Force advanced and engineering development program elements (PE 63718F - Electronic Warfare Technology, PE 64738F - Protective Systems, PE 64739F - Tactical Protective Systems) are developing the generic electronic warfare technologies necessary to counter the advanced threat radars. The Imaging Infrared (IIR) Maverick - PE 27162F, and the Highspeed Anti-Radiation Missile (HARM) - PE 27313F are both programmed for interface with the F-4G. A new inertial navigation system (ARN-101) is to be installed by Air Force Logistics Command as a Class IV modification and will interface with the APR-38 Attack/Warning Receiver on the F-4G. The above programs are responsible for developing and funding the required interfaces for the F-4G/APR-38 system; however, this program element will insure overall system capability/integration. Modification of the F-4G with performance updates developed in this program will begin in FY 1985.

6. (U) WORK PERFORMED BY: McDonnell Douglas, St Louis, MO is the primary contractor for the F-4G Wild Weasel Performance Update Program (PUP). Subcontractors for the PUP will be named later. Singer-Link, Binghampton, NY built and updates the F-4G simulator. Ogden Aerospace Logistics Center, UT is responsible for the management of F-4G enhancement programs. Air Force Systems Command (AFSC), Andrews AFB, MD, Air Force Test and Evaluation Center, Kirtland AFB, NM, and Tactical Air Command, Langley AFB, VA are jointly responsible for testing of the F-4G. AFSC is responsible for the subsystem and interface development of F-4G/APR-38 enhancements.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: 327B - F-4G Wild Weasel Squadrons

A. Project Description: The F-4G Performance Update Program (PUP) will enhance the capabilities of the F-4G to keep it a responsive system to the enemy threat environment into the 1990's. Intelligence data suggests that the radar threat will continue to increase in complexity and technical sophistication throughout this time period. It will also enable the F-4G to fully exploit the capabilities of the HARM. Immediate tasks include computer expansion, integration of the HARM, receiver/processor modification to handle agile and low probability of intercept threats, and frequency expansion t Future updates to the APR-38 will include detection, identification, and location of and other advanced threats. All updates will also be incorporated into the F-4G simulator.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The initial plan to award the PUP contract in FY 1982 was slipped one year due to nonresponsive bids on the original Request for Proposal (RFP). The RFP was rereleased in FY 82, McDonnell Douglas submitted a responsive bid, and the PUP contract was signed 25 Oct 82. The bid was considerably higher than originally estimated by Air Force Systems Command (AFSC) which necessitated substantial cost reprogramming actions. The original estimate was based on the cost data supplied by IBM in their technically non responsive bid to the original RFP, a computerized procurement costing model used by the Avionics Systems Division (ASD) of AFSC, and the cost estimates of the ASD engineering staff. The combination of IBM's bid being too low because of insufficient integration complexity assessment, the computer model being generic and not optimized for this specific system, and a better than one year schedule slip resulted in a significant increase in cost over the estimate. The majority of FY 1982 efforts involved negotiating the contract and restructuring the program and financial plan based on the negotiated contract.

(2) (U) FY 1983 Program: Phase I of the PUP, expansion of the computer from 64K to 256K storage capacity, began Oct 82. Phase II, frequency extension, capability against agile and low probability of intercept radars, capability against ground based jammers, and dense environment processing capability, will begin in 3/83. Phase I efforts in FY 1983 will be to build the new computer, translate the existing computer software program to standard language (MIL-STD-1750A), integrate HARM software program into computer, and improve ambiguity routines. Phase II efforts in FY 1983 will center on initiating full scale engineering development of the threat receiver/processor.

(3) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The HARM will be fully integrated into the F-4G/APR-38. R&D for Phase I of the PUP will be completed in FY 84. The new computer will undergo Developmental Test and Evaluation (DT&E) and Operational Test and Evaluation (OT&E) during the first half of FY 84. A production decision on the computer is scheduled for Mar 84. Phase II will continue work on the receiver/processor, develop new antenna arrays to increase frequency coverage to and improve accuracy, initiate simulator modifications, develop some new software support equipment, and modify existing hardware support equipment. The funding requested is based on the recently negotiated contract with McDonnell Douglas, Test and Evaluation (T&E) funds required by the Air Force Test and Evaluation Center, and the Singer-Link estimate for simulator modification/update.

Program Element: #27136F
DOD Mission Area: #224 - Defense Suppression

Title: F-4G Wild Weasel Squadrons
Budget Activity: #4 - Tactical Programs

(4) (U) Program to Completion: The new computers in Phase I will be procured and installed in FY 85 & 86. Initial Operational Capability (IOC) for Phase I is FY 1986. Phase II will continue full scale development through FY 85 & FY 86 ending in the first part of FY 87. Procurement of the receiver/processor, etc. in Phase II begins in FY 1986 with an IOC in FY 1988. The FY 1988 IOC for Phase II will terminate the formal PUP effort. However, this program element is a continuing program in that any future R&D efforts and/or modification programs for the F-4G will be funded through this PE.

C. (U) Major Milestones:

Milestones	Dates
A. PUP Contract Award	October 1982
B. Phase I Efforts Initiated	October 1982
C. Phase II Efforts Initiated	January 1983
D. Phase I Production Decision	June 1984
E. Phase II Production Decision	May 1986
F. Phase I IOC	September 1986
G. Phase II IOC	September 1988

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #27162F
DoD Mission Area: #224, Defense Suppression

Title: Tactical Air-to-Ground Missiles
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	4,284	4,790	6,124	3,734	0	38,021

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The increased sophistication, concentration, and lethality of enemy ground-based, radar guided, missile and antiaircraft artillery systems threaten the ability of tactical aviation to accomplish its mission and survive. Antiradiation missiles provide a lethal counter to this threat. The High Speed Anti-Radiation Missile (AGM-88, HARM) is being developed by the Navy to provide a significant upgraded capability against the threat. The F-4G Wild Weasel represents the only dedicated lethal defense suppression weapon system in the Air Force inventory. When deployed, HARM will be its primary weapon. This element will fund the Air Force unique portions of the joint Navy/Air Force HARM development program.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

						Total
RDT&E	4,284	4,790	3,759	-	-	29,146
Procurement (Missile)*	93,000	169,100	249,300	-	-	3,909,200
Quantities	136	206	368	-	-	14,331

The RDT&E difference in Total Estimated Costs is +$8.9 million which includes the FY 1984 addition of $2.4 million and the FY 1985 addition of $3.7 million for continued Pre-Planned Product Improvements, and a $2.8 million FY 1981 increase for full scale engineering development/test and evaluation. The FY 1982 missile procurement decrease of $2.0 million reflects reprogramming to another program. The FY 1983 missile procurement decrease of $53.5 million reflects a Congressional reduction of $47.3 million, a spares reduction of $5.3 million, and a general program reduction of $0.9 million. The FY 1984 missile procurement decrease of $63.6 million includes: -$58.2 million intended for a second source producer, and a -$5.4 million inflation adjustment due to revised rates. The missile procurement Total Estimated Costs difference is -$689.7 million reflecting a reduced inventory requirement of only HARM.

4. (U) OTHER APPROPRIATION FUNDS:

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Procurement (Missile)*	91,000	115,600	185,662	341,114	2,486,124	3,219,500
Quantities	118	129	285	872	7,602	9,006

*Includes initial spares

715 19

Program Element: #27162F
DoD Mission Area: #224, Defense Suppression

Title: Tactical Air-to-Ground Missiles
Budget Activity: #4, Tactical Programs

5. (U) RELATED ACTIVITIES: The HARM has been designated as the primary Anti-Radiation Missile for the F-4G Wild Weasel. A Memorandum of Agreement of July 1975 between the Air Force and Navy Assistant Secretaries for Research and Development names the Navy as the Executive Service and the Air Force as the Participating Service in the Joint Service HARM Development Program. The F-4G APR-38 Radar Homing and Warning Receiver is optimized in Program Element 27136F, F-4G Wild Weasel Squadrons, to fully utilize HARM's capabilities.

6. (U) WORK PERFORMED BY: The HARM Development Program is managed by the Navy HARM Program Office, at Naval Air Systems Command, Arlington, VA, with an Air Force Deputy Program Manager and staff. Management of Air Force unique requirements is provided by the Armament Division, Eglin AFB, FL. Principal contractors are: Texas Instruments, Lewisville, TX; McDonnell Douglas Aircraft Corporation, St Louis, MO; Thiokol, Brigham City, UT; and Motorola, Scottsdale, AZ. Government facilities such as the Aeronautical Systems Division, Wright-Patterson, AFB, OH; Naval Weapons Center, China Lake, CA; and the Air Force Flight Test Center, Edwards AFB, CA are also utilized. Air Force independent testing is conducted by dedicated personnel from the Air Force Test and Evaluation Center (AFTEC), Kirtland AFB, NM; and by operational Tactical Air Command pilots detailed to the AFTEC test detachment from George AFB, CA.

7. (U) TACTICAL AIR-TO-GROUND MISSILES (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984):

A. (U) Project Description: Project 2330, HARM. This project completes residual tasks remaining from the FY 1982 Initial Operational Test & Evaluation and from the February, 1983 Defense System Acquisition Review Council III. This effort also incorporates Pre-Planned Product Improvement activity in FY 1983-85, whose focus is to increase the cost effectiveness of the F-4G/HARM weapon system. RDT&E cost estimate is based on Program Office engineering cost projection and contractor quotes.

The HARM is an air-to-surface antiradiation missile which has been in development by the Navy since 1971. It is an evolution of current Anti-Radiation Missile (ARM) weapons designed to damage or suppress radar-directed air defense systems. Antiradiation missiles currently in the inventory (AGM-45 SHRIKE and AGM-78 STANDARD ARM) are

and SHRIKE procurement was terminated in FY 1978. The requirement for an advanced High Speed Anti-Radiation Missile (HARM) was identified by the Tactical Air Forces in March 1975. The Air Force has identified HARM as the solution for the near-term portion of this requirement. Missile design goals are: moderate missile size and weight,

and the ability to

The HARM, when integrated with the F-4G Wild Weasel, will give the Tactical Air Force a dedicated and highly capable antiradiation weapon system.

(U) The Air Force, as participating service in the joint Navy/Air Force HARM Program, will fund only those development efforts that are unique to the Air Force. The main thrust of this program will be to integrate the HARM with the F-4G. This integration will require the development and testing of computer software, tests necessary to certify the missile for carriage and launch from the aircraft, and ground and flight tests of the avionics/missile interface. Additionally, peculiar Air Force ground support equipment and technical manuals will be developed. The F-4G/HARM will be the only dedicated lethal defense suppression weapon system in the field for a considerable time into the future. As such, one focus of related follow-on Air Force HARM development effort in FY 1983/84 will be to conduct a Pre-Planned Product Improvement for HARM to optimize the F-4G/HARM cost-effectiveness.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

(1) (U) FY 1982 Accomplishments: A Joint/Navy senior level program review approved release of long lead FY 1982 procurement funding in advance of Milestone III, to preclude creating a costly gap between the FY 1981 concurrent pilot production and FY 1982 full production program. The joint Air Force Initial Operational Test and Evaluation began in Nov 1981, concurrent with Navy limited pilot production. The joint test was completed in November, 1982, in time for the Defense Systems Acquisition Review Council III in February, 1983. The joint test program prior to Milestone III will evaluate missiles, avionics, peculiar ground support equipment and government furnished equipment against the full range of operational effectiveness and suitability requirements. The Air Force plans to procure 118 missiles in FY 1982.

(2) FY 1983 Program: A Pre-Planned Product Improvement effort will be initiated by the Air Force to optimize the cost-effectiveness of the High Speed Anti-Radiation Missile. This effort includes (1) enhancement to improve system lethality, (2) software optimization to enhance search routines, decrease search time, and increase HARM footprint, (3) hardware design change to preclude possible (4) development of a feature for the missiles, and (5) reliability improvement for missile critical life items. Air Force plans to procure 129 missiles in FY 1983.

(3) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The Pre-Planned Product Improvement effort is continued. Air Force achieves a Operational Capability in The Air Force will conduct a Follow-on Operational Test and Evaluation to insure that any latent test issues that could arise in Initial Operational Test and Evaluation are incorporated and evaluated. Air Force plans to procure 285 missiles in FY 1984.

C. (U) Major Milestones:

Milestones		Dates
(1) (U) DSARC I		Oct 1972
(2) (U) DSARC II		Jan 1977
(3) (U) DSARC II A (additonally)		Feb 1978
(4) (U) DSARC II B		Nov 1980
(5) (U) Begin IOT&E		Nov 1981
(6) (U) DSARC III	*(Nov 1982)	Feb 1983
(7) (U) Air Force Deliveries begin		Nov 1983
(8) Air Force Initial Operational Capability		

Program Element: #27162F
DoD Mission Area: #244, Defense Suppression

Title: Tactical Air-to-Ground Missiles
Budget Activity: #4, Tactical Programs

* Date presented in Fiscal Year 1982 Descriptive Summary.

(U) Explanation of Milestone Changes: Slip in DSARC III is due to testing delays and administrative procedures.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Not applicable

Budget Activity: Tactical Program, #4
Program Element: #27162F Tactical Air-to-Ground Missiles

Test and Evaluation Data

1. (U) Development Test and Evaluation (DT&E): The AGM-88 High Speed Anti-Radiation Missile (HARM) is a joint Navy/Air Force project with the Navy as Executive Service. The Navy conducted Engineering Development under Program Element 64360N. Naval Weapons Center, China Lake was the lead organization. Texas Instruments was chosen as the Weapon System Integration Contractor. The Air Force monitored the Navy Development Test and Evaluation and also conducted eight of the eighteen live firings. Air Force Development Test and Evaluation addressed the integration of the HARM with the F-4G Wild Weasel, which contains the APR-38 avionics suite. Since 1977, modifications to the F-4G to integrate the HARM have been developed, bench tested, and flown in a series of captive flight missions. Computer software developed to integrate the HARM with the APR-38 has been bench/ground t sted; and evaluated in captive flight tests and HARM firings from the F-4G.

Prototype missiles and pilot production missiles were procured during DT&E. Prototype and pilot production hardware contain HARM capabilities which were developed during the extended phase of advanced development. Test results are shown in Navy Program Element 64360N Descriptive Summary.

Prototype Missiles - These missiles were tested to evaluate performance of the contractor prototype design against a variety of target signatures in five operational scenarios. The prototype hardware was subjected to ground tests, captive flight tests and firing tests. Objectives included acquisition and tracking of characteristic target signatures in various operational scenarios, compatibility with the full electromagnetic environment, and verification of hazard free performance to aircraft and handling personnel. An indication of operational effectiveness and suitability was obtained. The modified F-4G/APR-38 avionics capability to control and monitor the HARM was demonstrated. development test firings were completed, resulting in
The average miss distance was feet (as compared to the required foot circular error probable). Although these were development tests, they were fired by operational test pilots from both services. A Department of the Navy Systems Acquisition Review Council II B held in Nov 1980 evaluated test results of prototype missile firings, and approved proceeding to pilot production in 1981.

(U) Pilot Production Missiles - Forty-five pilot production missiles were allocated for both completion of Development Test in the Navy Technical Evaluation, and for the joint Air Force Initial Operational Test and Evaluation and Navy Operational Evaluation. Five of the forty-five pilot production missiles were fired by the Navy to complete Navy Technical Evaluation. The joint operational testing commenced in Nov 1981, and the balance of the forty pilot production missiles were allocated as follows. Twenty missiles were used for Navy Operational Evaluation, of which sixteen were fired. The Air Force utilized the remaining twenty missiles for Initial Operation Test and Evaluation, firing sixteen of the twenty missiles. The joint test was completed in time for the Defense System Acquisition Council III

Budget Activity: Tactical Program, #4
Program Element : #27162F Tactical Air-to-Ground Missiles

in December 1982. The test program prior to Milestone III will evaluate the pilot production missiles, avionics, peculiar ground support equipment and government furnished equipment against the full array of specification, operational effectiveness, and operational suitability requirements.

2. (U) Operational Test and Evaluation: Operational testing of the High Speed Antiradiation Missile (HARM) built by Texas Instruments, Lewisville, Texas is being conducted as a joint Navy operational test and evaluation (OPEVAL)/ Air Force initial operational test and evaluation (IOT&E) program. Each Service separately evaluates the missile with its own aircraft and avionics. However, test coordination planning and shared test results eliminate duplication of effort. The purpose of IOT&E is to evaluate the operational effectiveness and operational suitability of the HARM to provide a basis for the first major production decision.

(U) An Air Force preliminary evaluation (AFPE) was conducted (Jan 79-Oct 80) in combination with development test and evaluation (DT&E), using prototype missiles to obtain early data on operational effectiveness and suitability. During DT&E, eight missiles were fired from the F-4G Wild Weasel aircraft by operational aircrews from the Tactical Air Command (TAC). Navy and Air Force maintenance personnel monitored buildup, test, repair, and maintenance actions by the contractor.

(U) The Air Force HARM initial OPEVAL was conducted in a two-phase approach which began in November 1981 and was completed in October 1982. Both phases used pilot production assets integrated with production F-4G aircraft. Phase one, which ended in May 1982, consisted of six missile firings from the F-4G aircraft. In addition, an extensive captive carry flight program was carried out to evaluate missile effectiveness and reliability. Phase two, which began in June 1982, consisted of ten firings to validate a software enhancement update to the missile (equations of motion). Air Force testing was conducted on test ranges at Nellis AFB, Nevada; Naval Weapons Center, China Lake, California; and White Sands Missile Range, New Mexico. In addition, during phase one, an extensive captive carry evaluation program was conducted in USAFE. US Air Force Tactical Air Command crews have flown these missions, and missile buildup, test, loading, and maintenance have been provided by Air Force personnel. System performance and reliability criteria are outlined in DCP-93B, which is presently under revision and service coordination.

(U) OT&E reports published:

(1) High Speed Antiradation Missile (HARM) Air Force Preliminary Evaluation (AFPE), January 1981 (S).

(2) High Speed Antiradiation Missile (HARM) IOT&E Interim Report, May 1982 (S).

Budget Activity: Tactical Program, #4
Program Element: #27162F Tactical Air-to-Ground Missiles

3. System Characteristics:

CHARACTERISTICS	MILESTONE II B THRESHOLD	MILESTONE III THRESHOLD	MILESTONE III GOAL 1/	DEMONSTRATED
Range:				
(Level Launch) Nautical Miles				
5,000 Foot Altitude				
15,000 Foot Altitude				
30,000 Foot Altitude				
Accuracy:				
Median of the Closest Point of Approach (in Feet)				
Frequency Coverage:				
(Gigahertz)				
Pulse				
Continuous Wave				
Technical:				
Length (Feet)				
Diameter (Inches)				
Weight (Pounds)				
Time to Target (Level launch at 10,000 feet, 0.8 Mach to target at 10 nautical miles) (Seconds)				

Budget Activity: Tactical Program, #4
Program Element: #27162F Tactical Air-to-Ground Missiles

CHARACTERISTICS	MILESTONE II B THRESHOLD	MILESTONE III THRESHOLD	MILESTONE III GOAL 1/	DEMONSTRATED
Mean Flying Hours Before Failure (Captive Carry over 1850 test hours, 1.8 flying hours/sortie, including 1.0 hour full electrical power) (Hours)				
Reliability, Missile Captive Carry				
Reliability, Missile Free Flight				

Budget Activity: Tactical Program, #4
Program Element: #27162F Tactical Air-to-Ground Missiles

1/ (U) DCP-93 Goals - (Revision B in process)

2/ (U) Includes Air Force and Navy firings through Development Test and Evaluation firings

3/ (U) Demonstration based on results of Joint Air Force and Navy Development Test and Evaluation firings through 17 Aug 80. Approved program operational and technical characteristics will be demonstrated during operational evaluation (Navy Operational Evaluation/Air Force Initial Operational Test and Evaluation).

4/ (U) Results shown are based on the AFTEC interim IOT&E report only and reflect Air Force results from a limited sample size of 730.5 missile flight hours.

5/ Probability that HARM will be up and ready for launch after 20 captive carry flights of 1.8 hours duration per mission with full electrical power applied for one hour per mission. Relates to a Mean Flying Hours Before Failure threshold of] and goal of

6/ (U) Given an up HARM system at launch, probability of successful launch, target guidance (including flex logic operation, if required) and proper fuze and warhead function within the specified Median of the Closest Point of Approach. Target is defined as any emitter having parametric characteristics similar (within missile RF and search area discrimination limits) to one of the threat listings handed-off by the avionics.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #27247F
DoD Mission Area: #332, TIARA for Tactical Land Warfare

Title: Air Force TENCAP
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	299	285	271	265	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program has as its main objective the development of procedures, tactics, and interface equipment/software to facilitate tactical use of national intelligence systems within an operational framework. In 1977 Congress directed each service to establish a Tactical Exploitation of National Space Programs (TENCAP) office to improve military use of national systems. The FY 1983 funding and outyear programming provide continuing funding for this effort. Efforts will include evaluation and development of interfaces with national space programs and enhancement of our tactically deployed forces through tactical exercises and improved interfaces with the Intelligence Community. This will include necessary software development, equipment evaluation, and related studies.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	299	288	287		Continuing	Not Applicable

Differences between FY 83 and FY 84 Descriptive Summaries are due to slight changes in inflation indices.

4. (U) OTHER APPROPRIATION FUNDS:

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
Operation and Maintenance	5,102	3,389	3,825	4,019	Continuing	Not Applicable

Note: The Operation and Maintenance funds are used to conduct essential tactical exercises.

5. (U) RELATED ACTIVITIES: Will require interface with national intelligence systems.

6. (U) WORK PERFORMED BY: Air Force management of this effort will be under the Air Force Deputy Chief of Staff for Plans and Operations.

7. (U) Air Force TENCAP (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984)

A. (U) Project Description: This program has as its main objective the development of procedures, tactics and interface equipment/software to facilitate tactical use of national intelligence systems within an operational framework. Efforts will include participation in tactical exercises, software/hardware development and system interface and related development studies.

Program Element: #27247F
DoD Mission Area: #332, TIARA for Tactical Land Warfare

Title: Air Force TENCAP
Budget Activity: #4, Tactical Programs

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Information on accomplishments in FY 1982 is available at higher security levels and a complete review of this program is available in the FY 1984 Intelligence Related Activities, Congressional Justification Book.

(2) (U) FY 1983 Program: The FY 1983 program will continue exercise evaluation, software development programs and equipment and procedure evaluation. Efforts will be initiated for interface with various Air Force, other service and national intelligence programs to include studies, software modification and equipment evaluation. A continued involvement in tactical exercises will be pursued.

(3) (U) FY 1984 Program and Basis for FY 1984 RDT&E Request: On-going efforts will be continued. A growing involvement in tactical exercises with the RDJTF will be pursued. The FY 1984 cost estimates for these activities are based on the FY 1982 completed activities and projections for continuity into FY 1984.

(4) (U) Program to Completion: Tactical exploitation studies and exercises will be pursued.

C. (U) Major Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 27411F
DOD Mission Area: #352, Air Warfare Command and Control

Title: Overseas Air Weapons Control Systems
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	1,739	3,486	3,320	3,199	Continuing	Not Applicable Applicable
2704	EIFEL/II	1,239	2,000	1,970	1,849	Continuing	Not Applicable
2026	ACCS/ETACCS	500	1,486	1,350	1,350	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: EIFEL/DISTEL is an automated command and control system, for the United States Air Force operated Allied Tactical Operations Center at Sembach, Germany. Under Project 2704, EIFEL II, the United States Air Force will cooperate with the Federal Republic of Germany in the joint development of a follow-on system to substantially expand the current EIFEL/DISTEL system. The European Theater Air Command and Control Study (ETACCS) has been established to analyze and coordinate the accomplishments of the NATO team working on the NATO Air Command and Control System (ACCS) and to develop US coordinated positions relative to ACCS issues.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	2,291*	3,486	3,429**		Continuing	Not Applicable
Procurement (Other)			300			

*Actual FY 82 expenditures were less than the estimate in FY 83 Descriptive Summary due to a delay in negotiating an agreement with the Federal Republic of Germany. Also, there were funding limitations due to the ceiling on Mitre expenditures.

** Current FY 84 estimate has been adjusted for inflation reduction.

4. (U) OTHER APPROPRIATION FUNDS:

	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
Procurement (Other)	278	309	Continuing	Not Applicable

5. (U) RELATED ACTIVITIES: The Air Force is presently studying approaches to unit level automation which will be required for various important tactical command and control programs. The EIFEL II program is one of the leaders in this area.

Program Element: #27411F
DOD Mission Area: Air Warfare Command and Control, #352

Title: Overseas Air Weapons Control System
Budget Activity: Tactical Programs, #4

6. (U) WORK PERFORMED BY: The EIFEL II effort is being accomplished by the Air Force Systems Command (AFSC). MITRE Corp will provide technical support in this effort. The Air Force role in European Theater Command and Control System (ETACCS) will be accomplished by AFSC with MITRE support.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project 2644, EIFEL II: The purpose of the EIFEL system is to automate the command and control of tactical offensive air functions in the Central Region of NATO. The current EIFEL/DISTEL system provides an initial capability but does not provide automation at the unit level or the communications network necessary to provide interoperability, succession of command and survivability. The EIFEL II effort will correct these deficiencies. In FY 82 a joint US/FRG study group produced a program plan for a joint development which was staffed and reviewed at all levels. In FY 83 a Declaration of Intent will be signed, a PMD issued, and initial development activities will commence. In FY84, a unit level test bed will be installed. USAF development activities will concentrate on wing/squadron automation. Also, in FY84 a Multi-national Program Office will be established. In FY85 development activities will continue.

B. Project 2026, ETACCS/ACCS: The Air Force has been tasked to provide administrative funding for the U.S. representatives on the Air Command and Control System (ACCS) team. The ACCS team has been tasked to design an air command and control system for NATO. In FY82 the ETACCS Program Management Directive directed AFSC to study the issues raised by the ACCS team and develop U.S. staffed and coordinated positions. In FY83-FY85, NATO proposals for improving air command and control will be analyzed and issues identified. U.S. proposals for improving the USAF command and control system will be analyzed and evaluated in relation to the NATO proposals. U.S. goals, objectives and plans for improvements in the European theater will be developed.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 27412F   Title: Tactical Air Control System Improvements (TACSI)
DOD Mission Area: #352 Air Warfare Command and Control   Budget Activity: #4 Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	15,656	5,422	8,639	20,276	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The tactical Air Forces require a highly developed, reliable, positive control system to fully exploit the inherent capabilities of tactical air power. The Tactical Air Control System (TACS) provides the means through which the Air Force Component Commander exercises control of his forces to accomplish his assigned mission. This program provides for major improvements to the existing TACS which was deployed in the late sixties and early seventies and is nearing the end of its useful life. Some of the programs include developing a new transportable, modularized, software intensive, automated air command and control system and a series of electronic countermeasure programs to enhance the survivablity and capabilities of the AN/TPS-43E TACS radar. The FY 82-85 TACS improvement program is made up of the following efforts:

- System Trainer and Exercise Module (STEM)
- Modular Control Equipment (MCE)
- Ground Attack Control Capability (GACC)
- Ultra Low Sidelobe Antenna (ULSA)
- Anti-Radiation Missile Alarm Sensor (Arm Alarm)
- Anti-Radiation Missile Decoy (Arm Decoy)

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

RDT&E	1,195	5,422	5,455	-	Continuing	Not Applicable
Procurement (Other)	8,645	22,304	60,151	-	Continuing	Not Applicable

- RDT&E

  -- In FY 82 we reprogrammed $13M to start the MCE program, and added 1,463k to complete the R&D effort on the ULSA Program.

  -- In FY 84 we added $3.425M to the MCE program.

  -- In FY 83 we will be seeking a $16.5M reprogramming authority for the MCE program as we indicated to Congress in April 1982, when we requested the 13M reprogramming authority to start the MCE program.

- Procurement

  -- The $8.1M in FY81 and $8.6M in FY82 identified for STEM production option was diverted to other programs.
  -- In FY84 $12M was transferred from the ULSA to STEM to make up for the STEM losses in FY81 and FY82.

Program Element: # 27412F Title: Tactical Air Control System Improvements (TACSI)
DOD Mission Area: #352 Air Warfare Command and Control Budget Activity: #4, Tactical Program

-- In FY 84 $31.0M in production funds were cut when the Arm Alarm and MCE production programs were slipped in order to line them up with the R&D efforts.

4. (U) OTHER APPROPRIATION FUNDS ($ IN THOUSANDS):

		FY 1982	FY 1983	FY 1984	FY 1985	Additional To Complete	Total Estimated Cost
Procurement	(Other)	0	22,291	28,527	52,725	Continuing	Not Applicable
(Quantity)	ULSA		22	16	15		
	STEM			9			
	MCE				4		

(U) RELATED ACTIVITIES: This program interfaces with the Joint Interoperability of Tactical Command and Control Systems Program (PE 64779F), the Pacific Command and Control Systems (PE 27414F), the USAFE Command and Control System (PE 27415F), the TAC Command Control Systems (PE 27416F), and the Overseas Air Weapons Control Systems (PE 27411F).

The Modular Control Equipment (MCE) program is a joint program with the Marine Corps Tactical Air Operations Central (TAOC) program. Both contracts are administered by the USMC systems project office, Naval Electronics Systems Command, (NAVELEX PME-154) as per the 26 Jul 82 "Memorandum of Agreement between NAVELEX PME-154 and the Electronic Systems Division Tactical Air Battle Management Systems Program Office (ESD/TCR) Regarding the TAOC/MCE Full Scale Engineering Development Effort".

The Arm Decoy program is currently in advanced development at the Rome Air Development Center under the Advanced ECCM Program (PE 62702F). This program will transition to ESD/TCR in time to support a FY 85 research and development start.

The Ground Attack Control System will work closely with the Pave Mover (Joint Stars) program (PE 63747F) in attacking time sensitive mobile ground targets.

6. (U) WORK PERFORMED BY: Electronics Systems Division, Tactical Air Battle Management Systems Program Office, Hanscom Air Force Base, MA, is responsible for this program. Rome Air Development Center, Griffiss AFB, NY, and the Tactical Air Command, Langley Air Force Base, VA, provide engineering and operational support. Major contractors include GTE Sylvania, Needham Heights, MA (STEM); Westinghouse Corp, Baltimore, MD (ULSA); Litton Data Systems Van Nuys, CA, (MCE); and MITRE Corp., Bedford, MA, (Systems Engineering).

7. (U) TACTICAL AIR CONTROL SYSTEMS IMPROVEMENTS (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984):

A. (U) Project Description: The TACSI PE 27412F is made up of several ongoing R&D and production programs. The System Trainer and Exercise Module (STEM) provides a trainer to run realistic scenarios and exercises for the Control and Reporting Centers/Control and Reporting Posts (CRCs/CRPs) of the 407L Tactical Air Control System (TACS). The Modular Control Equipment (MCE) will provide modular replacement units for the aging and obsolescent CRCs/CRPs and Forward Air Control Posts of the TACS. It will enhance the TACS survivability, mobility, and provide the ability to handle the greatly increased C^3 workloads required in a modern combat environment. The Ultra Low Sidelobe Antenna (ULSA), the Anti-Radiation Missile Alarm Sensor (Arm Alarm), and the Anti-radiation Missile Decoy (Arm Decoy) are three parts of a single Seek Screen program to enhance the survivability and effectiveness of the AN/TPS-43E radar.

Program Element: #27412F
DoD Mission Area: #352 Air Warfare Command and Control

Title: Tactical Air Control System Improvements (TACSI)
Budget Activity: #4, Tactical Program

The ULSA program provides a new antenna for the AN/TPS-43E radar that reduces its susceptibility to being targeted by an anti-radiation missile and increases its capability against jamming. The Arm Alarm program will warn the radar operators of an aproaching anti-radiation missile in time for appropriate countermeasures. The Arm Decoy Program wil then lure the incoming anti-radiation missiles away from the radar. The Ground Attack Control Capability (GACC) will provide the TACS with the capability to control the air attack of time sensitive mobile ground targets. It is anticipated that the GACC will also employ MCE hardware.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) (U) FY 1982 Accomplishments: In FY 1982 the STEM and ULSA programs continued R&D efforts, the Air Force entered into a three year R&D effort with Litton Corporation on the MCE program; and the request for proposal for the Arm Alarm program was issued to industry.

(2) (U) FY 1983 Accomplishments: The plan for FY 1983 is to finish the STEM R&D program; finish the ULSA R&D program and start the production run; continue the MCE R&D effort; and award the Arm Alarm R&D contract.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The plan for FY 1984 is to exercise the STEM production option; continue the ULSA production run; finish the MCE design fabrication, integration and Development Test and Evaluation (DT&E) and start the Initial Operational Test and Evaluation (IOT&E); and continue the Arm Alarm R&D effort through design and fabrication and part of DT&E.

(4) (U) Program To Completion: This is a continuing program. In FY 1985 the MCE program is scheduled to finish the IOT&E program in the first quarter and to start on a multi-year production run; the R&D effort for the Arm Decoy program will start; the R&D effort for the Arm Alarm will finish; the GACC R&D effort will start; and the production run for the ULSA program will continue.

C. (U) MAJOR MILESTONES:

PROGRAM	R&D CONTRACT AWARD	START FIELD DT&E	START IOT&E	PRODUCTION DECISION	IDD
STEM	Oct 78	Nov 82	Mar 83	Sep 83	Jul 84
ULSA	Aug 80	Sep 82	Jan 83	Jun 83	Aug 85
MCE	Jul 82	Jun 84	Oct 84	2Q FY 85	4Q FY 86
ARM ALARM	Jun 83	Jul 84	2Q FY 85	3Q FY 85	3Q FY 86
ARM DECOY	Mar 85	May 86	Aug 86	4Q FY 87	TBD
GACC	TBD	TBD	TBD	TBD	TBD

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #27417F(64744F)
DoD Mission Area: #352 - Air Warfare

Title: Tactical Airborne Command and Control System (E-3A)
Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	51,810	66,980	69,106	65,188	174,941	1,865,200

NOTE: RDT&E funds for FY 1978 and prior were included in PE 64744F, Airborne Warning and Control System. Large aircraft terminal development for the Joint Tactical Information Distribution System (PE 64754F) is funded in PE 27417F.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program has as its main purpose the development and acquisition of an effective survivable airborne surveillance system for command and control of tactical forces and strategic defense of the United States. The E-3A Airborne Warning and Control System will overcome ground based surveillance system deficiencies through its unique ability to provide extended all altitude surveillance and, for the first time, the means to manage an air battle situation in real time. It will contribute significantly to a more effective integration of the capabilities of United States forces supporting United States, North Atlantic Treaty Organization or other worldwide requirements.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	52,402	78,852	62,228	12,600	21,882	1,666,400
Procurement (Aircraft)	257,900	176,700	220,200	489,300	1,112,500	4,546,200

RDT&E: In FY 83, the Appropriations Conference reduced the request by $11.9 million. In FY 84, changes result from program repricing based on better data and new starts for maritime surveillance and communications jam resistance improvements. The FY 85 changes are for program repricing based on better data and a new start for IFF jitter fix. Also in FY 85, additional funds are provided for continuing communications jam resistance improvement and starting electronic support measure, infrared search and track, computer tracker program upgrade, SATCOM, teletype, and self-defense system developments. Outyear increase results from program repricing based on better data, completion of IFF jitter fix, infrared search and track and other developments started in FY 85, and continuing electronic support measure development.

Procurement: Values include initial spares. Procurement funding decreased in FY 84, based on reduced quantity in FY 84. The decrease in advance buy funding in FY 85 is due to lower procurement quantity in FY 86. Overall, the production buy was rephased, increasing the unit cost.

Program Element: #27417F(64744F)
DoD Mission Area: #352 - Air Warfare

Title: Tactical Airborne Command and Control System (E-3A)
Budget Activity: #4 - Tactical Programs

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Costs
Procurement (Aircraft)						
Funds	262,100	149,500	76,200	460,000	1,692,400	4,924,900
Quantity	2	2	0	3	9	43

5. (U) RELATED ACTIVITIES: The Overland Radar Technology Program (Program Element 63701F) proved the feasibility of overland radar in support of an airborne warning and control system. The conceptual portion of the E-3A program was funded under Program Element 63402F prior to December 1967. The North Atlantic Treaty Organization Airborne Early Warning and Control System (Program Element 64752F) was established in FY 1978 to fund United States share of the North Atlantic Treaty Organization development effort (subsequently changed to Program Element 01012F). The Foreign Military Sale of the E-3A to Saudia Arabia was approved in October 1981.

6. (U) WORK PERFORMED BY: The Air Force management is provided by the Electronic Systems Division, Hanscom AFB, Bedford, Massachusetts. The major contractors are Boeing Aerospace Company, Seattle, Washington (Air Vehicle and Integration); Westinghouse Electric Corporation, Baltimore, Maryland (Radar); International Business Machines, Owego, New York (Data Processor); Hazeltine Corporation, Long Island, New York (Displays); Hughes Aircraft Company, El Segundo and Fullerton, California (Communications and Joint Tactical Information Distribution System Digital Data Link); Pratt and Whitney Aircraft Division of United Aircraft Corporation, Hartford, Connecticut (Engines). Four additional major contracts total $71.7 million.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: None.

8. (U) SINGLE PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: E-3A Airborne Warning and Control System

A. (U) Project Description: The E-3A Airborne Warning and Control System will support a variety of tactical air operations and the air defense of the continental United States. It will overcome current deficiencies of present ground based systems (range, vulnerability, limited effectiveness against low altitude targets and susceptibility to electronic countermeasures). The capability to detect and track targets against ground clutter makes the E-3A effective against low-altitude targets. Since the radar is mounted on a high flying jet aircraft, increased surveillance volume and detection range are realized. Mobility, coupled with the awareness of potential threats, and the ability to command weapons in its own defense, make the E-3A highly survivable.

The airborne platform is a Boeing 707 aircraft equipped with radar, communications, identification sensors, navigation units and data processor to provide an integrated presentation of the air situation on operator display consoles. Software changes in the central processor configure the E-3A for tactical or strategic defense missions. The E-3A is capable of detecting and tracking low flying aircraft targets in the presence of ground clutter, detecting bomber aircraft

Program Element: #27417F(64744F) Title: Tactical Airborne Command and Control System (E-3A)
DoD Mission Area: #352 - Air Warfare Budget Activity: #4 - Tactical Programs

at a distance of [ ] nautical miles, detecting tactical aircraft up to [ ] nautical miles, computer tracking of up to [ ] targets, 6.2 hours on station time at 1000 nautical miles from base, and active interrogation of aircraft using a cooperative beacon in cryptological secure or standard modes. Command and control improvements as well as electronic counter-countermeasures improvements are planned for the E-3A to exploit its inherent capabilities and to keep pace with the evolving threat.

(U) The E-3A significantly enhances the combat effectiveness of air, ground and naval forces. Strategic defensive forces will utilize the E-3A, in conjunction with interceptor forces, for the wartime defense of the continental United States and as an integral element of the mobile air defense force for contingencies requiring air defense outside the United States. Tactical forces will use the E-3A for command and control during the deployment of tactical air forces; and in accomplishing interdiction, rescue and airlift missions. Its flexibility and versatility will enable it to be deployed at any level of military action ranging from a show of force through general war. During these deployments, the means will exist, for the first time, to manage the air and sea battle.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The United States/North Atlantic Treaty Organization Standard configuration Initial Operational Test and Evaluation testing was successfully completed. Full scale development continued on additional radios and multipurpose consoles. Preliminary design and brassboard engineering development continued to incorporate selected new technologies into the E-3A to assure its resistivity to the evolving electronic countermeasures threat.

(2) (U) FY 1983 Program: Full scale development to integrate additional radios and multipurpose consoles into the E-3A will continue. Flight testing begins for this expanded command and control configuration. As part of the process of incorporating new technologies into the E-3A to assure its resistivity to the evolving electronic countermeasures threat, brassboard engineering development of a selected electronic counter-countermeasure design will continue, and the validation phase will begin for the Improved Radar Data Correlator. Development begins for the Mission Simulator Improvement Program pending favorable Congressional consideration to remove restrictive Continuing Resolution Authority language.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Full scale development and flight testing to integrate additional radios and multipurpose consoles into the E-3A will continue. Development of a selected electronic counter-countermeasure design will be completed. Validation continues for the Improved Radar Data Correlator needed to correct maintainability problems and to provide for additional computing capacity for planned improvements. Development will continue for the Mission Simulator Improvement Program that will provide much needed expansion in training capability, and thus increase the quantity and quality of mission crew training. Initial funds are programmed to define needed maritime and supplemental surveillance systems improvements and to begin development of a communications system electronic counter-countermeasure improvement. Fiscal year 1984 cost estimates are based on firm contract prices and program office estimates.

(4) (U) Program to Completion: Concludes development and testing to integrate additional radios and consoles into the E-3A, mission simulator improvements, validation of the Improved Radar Data Correlator, and a communications

Program Element: #27417F(64744F) Title: Tactical Airborne Command and Control System (E-3A)
DoD Mission Area: #352 - Air Warfare Budget Activity: #4 - Tactical Programs

system electronic counter-countermeasure improvement. Accomplishes full scale development for IFF jitter fix, permanently installed SATCOM and teletype systems, an electronic support measure system, an infrared search and track system, and integration of a self-defense system.

C. (U) Major Milestones:

	Milestones	Date
1.	(U) Engineering Development Contract Award	July 1970
2.	(U) First Flight (Brassboard)	March 1972
3.	(U) End of Flight Test of Brassboard	August 1972
4.	(U) Start of Development Test and Evaluation	January 1973
5.	(U) System Demo Flight Tests Begin	March 1974
6.	(U) System Demo Test and Evaluation Completed	December 1974
7.	(U) Start of Production	March 1975
8.	(U) First Test Flight of First Development, Test and Evaluation Aircraft	August 1975
9.	(U) Development Flight Test Complete (Core)	January 1977
10.	(U) Interim Operational Capability (Core)	April 1978
11.	(U) Maritime Radar Flight Test Complete	July 1980
12.	(U) Standard Configuration Flight Test Complete	October 1981
13.	(U) Command and Control Improvements Flight Test Complete	March 1984
14.	(U) Improved Radar Data Correlator Validation Phase Complete	September 1985

Budget Activity: Tactical Program, #4
Program Element: 27417F, Tactical Airborne Command and Control System

E-3A AIRBORNE WARNING AND CONTROL

Test and Evaluation Data

1. (U) Development Test and Evaluation

(U) The E-3A Development Test and Evaluation test program was combined with Initial Operational Test and Evaluation test objectives in as realistic an operational environment as possible. The prime development contractor is The Boeing Company. The overall ojectives of the test effort were to: (a) validate/verify E-3A performance in accordance with design specifications; (b) determine E-3A performance and capability to fulfill operational requirements including interservice interoperability demonstrations; and (c) verify Air Force capability to support the E-3A with standard operational maintenance, logistics and training units using prescribed procedures. The first phase of three Development Test and Evaluation phases used a Brassboard engineering model and tested the airworthiness of the rotodome, demonstrated the feasibility of competing overland radar technologies (Hughes and Westinghouse) and demonstrated successful integration of radar targets and computer display equipment. This phase was flown from March through November 1972, and resulted in Westinghouse being selected to continue radar development.

2. (U) Operational Test and Evaluation (U)

The E-3A test program is being conducted as a combined Development Test and Evaluation/Initial Operational Test and Evaluation.

Core E-3A Follow-on Operational Test and Evaluation (U)

(U) Follow-on Operational Test and Evaluation, initiated in January 1977, was conducted in two phases with operational crews using production aircraft, training equipment, and support equipment. Phase I, Follow-On Operational Test and Evaluation, managed by the Air Force Test and Evaluation Center, was completed in February 1978. This phase was designed primarily to refine the operational suitability (reliability, maintainability, availability, and logistics supportability) assessment made during Phase III Initial Operational Test and Evaluation. Because Initial Operation Test and Evaluation assessments were constrained by the development, test and evaluation contractor-managed environment, Phase I Follow-on Operational Test and Evaluation provided the first opportunity for a detailed assessment of E-3A suitability under Air Force hands-on maintenance management. The operational effectiveness objectives addressed during Phase I Follow-on Operational Test and Evaluation were those not completed in Initial Operational Test and Evaluation, or those where the contractor had made equipment changes after Initial Operational Test and Evaluation and before production delivery. Test data were collected on a noninterference basis during the 552nd Airborne Warning and Control Wing primary function of training for attainment of Phase I Initial Operational Capability. No aircraft were dedicated to the test effort. Follow-on Operational Test and Evaluation flight data were gathered from training missions and during an E-3A deployment to Europe. This deployment,

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commonly referred to as "EUROTEST 77," provided the first opportunity to assess the logistics supportability of the E-3A in an overseas location. It also provided additional data on the integration of the E-3A into the existing North Atlantic Treaty Organization ground command and control system, and information on the E-3A radar compatibility within the European Central Region electromagnetic environment. The results of this first phase of Follow-on Operational Test and Evaluation were reported in the Air Force Test and Evaluation Center AWACS Follow-on Operational Test and Evaluation Phase I Final Report, July 1978 (S). Test results confirmed that the production E-3A can effectively and efficiently perform its prescribed mission and that the E-3A will greatly enhance the capability of the Air Force to conduct tactical air operations. However, several significant reliability and maintainability problems and deficient logistic support areas were identified for improvement. Phase II Follow-on Operational Test and Evaluation, managed by the Tactical Air Command, was initiated in March 1978 to refine Initial Operational Test and Evaluation and Phase I Follow-on Operational Test and Evaluation assessments with emphasis on tactics and procedures. The United States Air Force Tactical Fighter Weapons Center managed the Phase II Follow-on Operational Test and Evaluation for the Tactical Air Command with the test team collocated at the 552nd Airborne Warning and Control Wing's main operating base, Tinker Air Force Base, OK. The test team, with representatives from the Tactical Air Command, the North American Air Defense Command and the Air Force Systems Command, conducted the test in conjunction with normal training and maintenance activities of the 552nd Airborne Warning and Control Wing. No dedicated resources, beyond the test team, were used for the Phase II evaluation. Major test objectives included: evaluate corrective actions for previously identified deficiencies; refine E-3A tactics and provide information on procedures and doctrine; and verify and refine estimates of the production E-3A operational effectiveness and suitability.

(U) Phase II, Follow-on Operational Test and Evaluation was completed during May 1980. Test reporting by the United States Air Force Tactical Fighter Weapons Center was accomplished in two parts. Part A of the final report covering the period of March 1978-May 1979 was published in May 1980 titled, Volume I, E-3A Airborne Warning and Control System (AWACS) Follow-on Operational Test and Evaluation (FOT&E), Phase II. Part B was published in October 1980 titled, Volume II, E-3A Airborne Warning and Control System (AWACS) Follow-on Operational Test and Evaluation (FOT&E), Phase II. A multicommand radar maintenance evaluation lead by Air Force Test and Evaluation Center was also conducted in parallel with the Phase II Follow-on Operational Test and Evaluation to evaluate the E-3A Built-in-Test/Fault-Isolate-Test capability to support daily maintenance activities. This test began in July 1978 and was complete in June 1980. A separate built-in-test/fault-isolate-test report by the United States Air Force Tactical Fighter Weapons Center was published in June 1981 titled, Final Report, E-3A Surveillance Radar Built-In-Test (BIT)/Fault-Isolate-Test (FIT) Evaluation. During Part A, Phase II Follow-on Operational Test and Evaluation, the 552nd Airborne Warning and Control Wing accumulated over 8,300 flying hours and 1,200 sorties, while participating in 24 major exercises. The test team participated in a cross section of these activities in support of Follow-on Operational Test and Evalution objectives. Phase II findings support the conclusions of Initial Operational Test and Evaluation and Phase I Follow-on Operational Test and Evaluation that the production E-3A can effectively perform its prescribed mission. The following results/observations are provided: Tactics and procedures refinement/development: Physical arrangements for the North American Air Defense Command battle staff aboard the Core E-3A as previously reported, are insufficient to effectively support E-3A mission crew and command element simultaneously. Additional communications and display consoles are required. Progress has been achieved through interaction between E-3A and functional tactical operations. Baseline procedures were formulated to exploit E-3A look-down capabilities in support of close air support, forward air control and rescue missions. E-3A air assault procedures were also developed, providing the commander of airlift forces a realtime presentation of airborne operations.

Tactical control procedures were developed as a result of E-3A interaction with the fighter community in counter-air scenarios. This method of control was designed to enhance counterair operations by adjusting E-3A support to the capabilities and requirements of various fighter aircraft. Electronic Counter-Countermeasures: [

] Early Warning and Surveillance: E-3A deep-look and look-down capabilities consistently extended detection and tracking of air targets beyond the coverage of ground based radars. During several exercises, [

] a factor directly related to E-3A orbit locations. Operational Suitability: Operational and hardware reliability were rated satisfactory and reflect a favorable trend. Although significant progress was made, contractor maintenance support is still required. Nonavailability of technical orders continues to delay establishment of a full repair capability. Deficiencies in the supply support posture, reported in Phase I, continued to affect the overall availability of mission-capable aircraft. Needed spares are subject to budgetary constraints and production lead times and remain a matter for top-level management. Excessive cannibalization and use of production line loaners will continue to be required for daily operations until inventories reflect true spare requirements.

E-3A Enhancements Initial Operational Test and Evaluation (U)

(U) Background. Decision Coordinating Paper 5, Revision 3, 5 March 1976, approved continued production of the E-3A, and the development of a selected set of system enhancements chosen to provide a fully effective worldwide force. The enhancements were to be developed as separate entities and integrated into the E-3A for testing as the enhancement items became available. In May 1976, the Deputy Secretary of Defense directed the Air Force to plan for an Office of the Secretary of Defense review of the E-3A enhancement program when the respective enhancement development efforts are essentially completed. He further stated that it is contemplated that the Defense Systems Acquisition Review Council would then review development and test status and consider the operational utility of the respective enhancements in light of an updated threat evaluation prior to committing the government to production. The purpose of operational testing of the enhancements is to provide an evaluation of the operational utility of each enhancement for the Defense Systems Acquisition Review Council review. In December 1978, North Atlantic Treaty Organization signed an agreement with the United States Government (as their agent) for the procurement of 18 E-3A aircraft. To support this commitment and the United States Standard configured E-3A aircraft, the Air Force received the Office of Secretary of Defense approval for limited production authority for a Maritime Surveillance Capability radar capability and a Joint Tactical Information Distribution System capability in E-3A Decision Coordinating Paper Number 5, Revision 4, 6 March 1980.

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(U) The United States Standard E-3A (Block 10) configuration was developed in two steps. Step I, an interim configuration (Block 05), incorporated enhancements sponsored by the United States Government, while Step II included enhancements sponsored by the North Atlantic Treaty Organization. The United States Standard E-3A is a Core E-3A plus Maritime Surveillance Capability, a Joint Tactical Information Distribution System Hughes Improved Terminal, upgraded computer program functional group, and modified data analysis processor group. The Development Test and Evaluation/Initial Operational Test and Evaluation of the North Atlantic Treaty Organization E-3A (Block 15) and the United States Standard E-3A was combined to the greatest extent possible.

Past Enhancement Testing. Development Test and Evaluation/Initial Operational Test and Evaluation of an advanced development Joint Tactical Information Distribution System Terminal (waveform B) has been completed. Testing began during May-June 1978 with a preliminary evaluation of the Joint Tactical Information Distribution System time-division-multiple-access system onboard an E-3A. The purpose of this test was to determine Joint Tactical Information Distribution System communications coverage, E-3A system performance in a Joint Tactical Information Distribution System environment, and provide an initial estimate of the operational effectiveness/suitability of the time-division-multiple-access communication system planned for the E-3A under the Office of the Secretary of Defense approved enhancement program. This Development Test and Evaluation/Initial Operational Test and Evaluation effort provided an opportunity to test the concept of spread spectrum and frequency hopping as a transmission technique in a simulated operational environment. Major emphasis was placed on assessing the electronic counter-countermeasures capability of the system. Operational test results demonstrated electronic countermeasures resistivity and operational effectiveness potential of the Joint Tactical Information Distribution System terminal. However, until corrected, [ ] Results of this test were reported in the December 1978 Air Force Test and Evaluation Center E-3A Joint Tactical Information Distribution System Terminal Initial Operational Test and Evaluation Report.

(S) The Maritime Surveillance Capability radar components and software were installed and checked out by the contractor in July 1980. However, the modified data analysis processor group and upgraded computer program functional group through which the Maritime Surveillance Capability must be operated would not be qualified until September 1981. To lower the risk of going into production and to give the Office of the Secretary of Defense some assurance that the maritime radar would meet the operational requirements, a preliminary operational effectiveness assessment of the maritime radar modification was conducted by the Air Force Test and Evaluation Center from 15 July - 30 August 1980. This assessment was limited to determining if the E-3A radar with the maritime modification met specifications requirements and operational performance thresholds. The results indicate that maritime equipped E-3As have the potential to provide a significant capability to conduct or augment combined air/maritime operations. [ ] Results of this test were reported in the October 1980 Air Force Test and Evaluation Center E-3A Maritime Surveillance Capabilities Preliminary Operational Effectiveness Assessment Report. The Joint Tactical Information Distribution System Hughes Improved Terminal was installed on the E-3A in April 1981 and

Budget Activity: Tactical Program, #4
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contractor testing was completed during September 1981. This E-3A Hughes Improved Terminal is a version of the Hughes Improved Terminal included in the Joint Tactical Information Distribution System adaptable surface interface terminal tested by Air Force Test and Evaluation Center from April-November 80. Results of the test were reported in the March 1981 Air Force Test and Evaluation Center Joint Tactical Information Distribution System Adaptable Surface Interface Terminal Initial Operational Test and Evaluation Report.

The Initial Operational Test and Evaluation of the United States Standard E-3A and the continental United States portion of the North Atlantic Treaty Organization E-3A was conducted by Air Force Test and Evaluation Center from 15 September through 30 October 1981. Using Test System-3, primary flight operations were staged from Tinker AFB, Oklahoma in support of test locations which included Alaska, California, Florida, and Washington. A total of eighteen test missions were flown in a variety of scenarios designed to test the Block 10/15 E-3A's Maritime Surveillance Capability, Joint Tactical Information Distribution System Terminal, radio teletypewriter/Link 14, computer and modified operational software. Overall operational effectiveness and suitability were satisfactory and the United States/North Atlantic Treaty Organization E-3A, as tested, supported the user's operational requirements. Significant results can be summarized as follows: The addition of the[

] The overall reliability and maintainability of the modification to the surveillance radar, computer, communications, environmental control, and electrical subsystems were satisfactory. Test results did not indicate any reduction in the satisfactory reliability and maintainability of the Core E-3A. However, Joint Tactical Information Distribution System terminal reliability requires improvement. Integration of the improvements into the United States/North Atlantic Treaty Organization E-3A increased system operational capability. The United States/North Atlantic Treaty Organization E-3A demonstrated the potential to be a decisive element in the command, control and surveillance arena.

Budget Activity: Tactical Program, #4
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(U) Planned Enhancement Testing. The Block 20/25 configuration will be a retrofit program of the Block 01 (Core) and Block 10 (Standard) configured E-3As. Block 20 will consist of Block 01 plus the Joint Tactical Information Distribution System, computer modification, one high frequency radio, five ultra high frequency radios, three situation display consoles, and a command console enhancement. Block 25 will consist of Block 10 plus five ultra high frequency radios, three situation display consoles and a command console enhancement. Initial Operational Test and Evaluation of this configuration is not required due to similarity with the Block 10 configuration which recently completed operational tests. The Block 30/35 configuration will be a retrofit of selected electronic counter-countermeasure enhancements into the Block 20/25 aircraft. Testing of these improvements is tentatively planned to begin in 1986.

(U) Operational and Technical Characteristics

(U) Comparison: System Integration Demonstration (Test System 1)/ Production

(U) GENERAL	TEST SYSTEM #1	E-3A/CORE	E-3A/STANDARD
Crew Size	11	17	17
Production or Production Prototype Systems	NO	YES	YES
Radar	YES	YES	YES
Navigation	YES	YES	YES
Data Processor	YES	YES	YES
Display	YES	YES	YES
Identification Friend or Foe	YES	YES	YES
On-Board Test Maintenance and Monitor	YES	YES	YES
Communications	PARTIAL	YES	YES

(U) HARDWARE			
Consoles	4	9	9
Auxiliary Display Unit	1	2	2
Ultra High Frequency Radios	4	14	14
High Frequency Radios	1	2	3
Very High Frequency/Amplitude Modulation Radios	2	3	3
Very High Frequency/Frequency Modulation Radios	0	1	1

Budget Activity: Tactical Program, #4
Program Element: 27417F, Tactical Airborne Command and Control System

CAPABILITY	TEST SYSTEM #1	E-3A/CORE	E-3A/STANDARD
Radar Targets/Scan			
Identification Friend or Foe Targets/Scan			
Data Processing Track Capacity			
Data Processing Simultaneous Intercept			

Comparison: E-3A Core (Block 05) Requirements to Demonstrated Performance

TECHNICAL CHARACTERISTICS	E-3A CORE REQUIREMENTS	DEMONSTRATED PERFORMANCE
Detection Range (0.9 Probability in 1 Minute)		
Bomber (Nautical Miles)		
Fighter (Nautical Miles)		
Crew Size	17	17
System Track Capacity		
Simultaneous Intercepts		
Targets Position Accuracy (Nautical Miles)		
Time on Station at 1000 Nautical Miles from Base in hours	6.1	6.2

(U) RELIABILITY AND MAINTAINABILITY CHARACTERISTICS

Probability of Completing 9 hour Mission	0.88	0.88
Maintenance Manhour/Flight Hour	28.0	29.1*
In-Commission Rate	80%	95.7%
Probability of Fault Detection	95%	97%
Probability of Fault Isolation (To 3 Primary Units)	90%	95%
Turn Around Time	90% in 5.5 hrs	90% in 4.8 hrs
False Alarm (Probability of not Detecting Failure)	0.8	.03

*Actual data experienced during FY 1982 for aircraft delivered to TAC.

Budget Activity: Tactical Program, #4
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Comparison: E-3A Standard (Block 10) Design Requirements to Demonstrated Performance

TECHNICAL CHARACTERISTICS	THRESHOLD	GOAL	DEMONSTRATED PERFORMANCE
Maritime Surveillance Capability			
Maximum Detection Range (Nautical Miles)			
Fast Patrol Boat			
Destroyer			
Maritime Targets Tracking Accuracy			
Position (Nautical Miles)			
Heading (Degrees)			
Speed (Knots)			
Maritime Targets Position Accuracy with Electronic Countermeasures (Nautical Miles)			
Maritime Targets Detection Range with Electronic Countermeasures (Nautical Miles)			
Maritime Target/Land Resolution (Nautical Miles)			
Joint Tactical Information Distribution System			
Message Transfer Ratio (Percent)			
Electronic Counter-Countermeasure Margin (Decibels)†			
Net Initialization Time (Minutes)			
Net Entry Time (Minutes)			
Terminal Initialization Time (Minutes) Automatic			

* Sea states were defined as M-moderate (1-5ft), R-rough (5-8ft), VR-very rough (8-12ft), and H-high (over 12ft).
** Not obtained during Initial Operational Test and Evaluation conducted 15 September to 30 October 1981.
† Mode 1 double pulse continuous full band average jammer power divided by average signal power.
†† Estimated based on manual initialization time of [ ]

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #27423F
DoD Mission Area: #345 - Tactical Communications

Title: Advanced Communication Systems
Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	51,510	10,879	65,216	86,011	393,865	616,281
2939	HAVE CLEAR	48,510	9,990	57,949	84,944	390,465	591,858
2482	HAVE QUICK	0	0	0	0	0	8,800
2614	SINCGARS-V Integration	1,500	889	3,267	1,067	3,400	10,123
2982	HAVE QUICK II	1,500	0	4,000	0	0	5,500

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: [

] The Air Force relies on UHF for primary tactical command and control. Disruption of these communications could degrade the effectiveness of tactical forces by [ ] HAVE CLEAR is an advanced technology program intended for all UHF voice communications and will provide jam resistance independent of the long term threat. HAVE QUICK is a near-term program applying demonstrated technology and providing an urgently needed resistance to jammers [ ] while HAVE CLEAR is being developed. The Air Force will participate with the Army to plan for the integration of the Single Channel Ground and Airborne Radio System (SINCGARS) VHF jam resistant capability in those weapon systems requiring direct communications with Army, Navy, and NATO forces using SINCGARS-V. This is part of an overall requirement directed and coordinated by the Joint Chiefs of Staff. HAVE QUICK II is the program to develop HAVE QUICK operational enhancements and performance improvements required to meet the evolving near-term threat until HAVE CLEAR is fielded.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	50,410	78,210	89,758		Continuing	N/A
PROCUREMENT	12,256	46,672	305,372		2,336,900	2,702,200

During Congressional Review of UHF anti-jam radio programs, the SEEK TALK Full Scale Development (FSD) program was redirected. As a result of the restructuring, the technical parameters were modified, studies were initiated, and HAVE CLEAR emerged as the solution to the long-term threat. HAVE CLEAR will use a different signal structure and waveform than SEEK TALK and will employ increased power. In addition, [ ]

Program Element: #27423F
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Title: Advanced Communication Systems
Budget Activity: #4 - Tactical Programs

The HAVE CLEAR program will defer implementation of the adaptive antenna array while doing some development effort to maintain it as a later growth option, if required. The program restructuring is the reason for the significant changes in RDT&E and Procurement funding.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
AIRCRAFT PROCUREMENT						
2939 - HAVE CLEAR					2,552,100	2,552,100
Quantities					5,579	5,579
2982 - HAVE QUICK II			7,000			7,000
Quantities			1518			1518
OTHER PROCUREMENT						
2939 - HAVE CLEAR					463,700	463,700
Quantities					2,748	2,748
2982 - HAVE QUICK II			1,989			1,989
Quantities			810			810

5. (U) RELATED ACTIVITIES: The Air Force is participating in the Army Single Channel Ground and Airborne Radio System (SINCGARS) program, PE 63746A, as part of the Joint Chiefs of Staff validated Joint Operational Requirement. Requirements and technical approach are presently being explored with the Navy and Army for the purpose of insuring interoperability. Formal interoperability tasks are part of this program. Techniques which are developed by the Air Force, as the Joint Chiefs of Staff lead service for the development of airborne technical specifications, will be coordinated with similar techniques being developed by the other Services.

(U) HAVE CLEAR requirements and technical approach are presently being coordinated with the Army and Navy for the purpose of insuring interoperability. The goal is to make HAVE CLEAR compatible with all versions of JTIDS.

(U) HAVE CLEAR is the replacement program for SEEK TALK, PE 27423F, Project 2277.

6. (U) WORK PERFORMED BY: Hazeltine Corporation, Greenlawn, NY, is the contractor for design of a modified version of SEEK TALK. Magnavox Corporation, Ft Wayne, IN is the prime contractor for HAVE QUICK. The HAVE QUICK II and SINCGARS contractors have not yet been selected. The major in-house organizations include the MITRE Corporation, Bedford, MA

(all projects); MIT Lincoln Laboratory, Lexington, MA (HAVE CLEAR); Electromagnetic Compatibility Analysis Center (ECAC), Annapolis, MD (all projects); and the 4950th TW, Wright Patterson AFB, OH, (SINCGARS).

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 2982, HAVE QUICK II: HAVE QUICK was originally developed as a quick reaction capability program. Comparatively little formal testing was accomplished on the HAVE QUICK radios. [

] HAVE QUICK II will counter the updated threat. During FY 82 and early FY 83 an investigation was made under Project 2913, SEEK BARON, to determine appropriate HAVE QUICK upgrades, evaluate ultimate HAVE QUICK performance and determine the urgency of upgrades. Projected improvements will increase the modulation index, increase the number of frequencies over which HAVE QUICK can operate, and increase transmit power on appropriate platforms. Full scale development is planned to begin in FY 83 and continue through FY 84.

B. (U) Project: 2614, SINCGARS-V Integration: The Army has been given development responsibility for a new family of Single Channel Ground and Airborne Radio Systems-VHF (SINCGARS-V). In FY 82 and prior, this project has allowed Air Force participation in the Army SINCGARS program and provided limited engineering development required to integrate SINCGARS-V into tactical aircraft. The SINCGARS-V program will modernize current field radios and provide secure ECCM. This project participation ensures Air Force interoperability with Army, Navy, and NATO forces using SINCGARS-V. The Air Force is consolidating operational compatibility and integration requirements for use of SINCGARS-V by Tactical Air Forces. Options for acquiring SINCGARS-V interoperability have been developed. The Army Advanced Development program is being monitored and the Air Force is participating in program reviews. Electromagnetic compatibility analysis has been initiated. Antenna installation studies are being conducted. In FY 83, the Air Force will participate in the Army DT&E/IOT&E program, develop airborne SINCGARS-V specifications, and continue coordinated development activities with the Army SINCGARS-V, to include system engineering and test support. Electromagnetic compatibility analyses will continue to develop a ground radio installation plan. Full scale development for the Air Force/Army common items will begin in FY 84.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: 2939, HAVE CLEAR

A. Project Description: The HAVE CLEAR program is developing a communication system to protect critical tactical air operations line of sight ground-to-air and air-to-air voice communications against[

]

B. (U) Program Accomplishments and Future Efforts:
(1) (U) FY 1982 Accomplishments: The competitive design phase of SEEK TALK was concluded in Feb 82, and selection of a single contractor for the balance of FSD was made. A Tri-Service Steering Group (TSSG) on Tactical Anti-

Jam (AJ) Communications recommended additional study of Air Force Communications architecture alternatives, including a modified version of the SEEK TALK system. AFSARC and DSARC review endorsed the TSSG recommendation. An Air Force study is ongoing to evaluate architecture alternatives.

(2) (U) FY 1983 Programs: The Modular Anti-Jam Integrated Communications (MAJIC) study examined a number of alternative approaches to satisfy Air Force AJ communication requirements, ranging from old SEEK TALK to a new modular, integrated communication system. A Mar 83 DSARC level review will determine the best approach to satisfy the high anti-jam voice requirement. FSD will start following DSARC approval.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The preliminary and critical design reviews are planned. Fabrication of DT&E/IOT&E airborne and ground equipment will commence for the four FSD platforms: OV-10, A-10, GRC-206, and TPS-43E. DT&E/IOT&E test planning will commence. Follow-on integration efforts for non-IOC platforms will be initiated.

(4) (U) Program to Completion: Fabrication of DT&E/IOT&E equipment will be completed. Formal contractor qualification testing, Class II mods on test platforms, and DT&E/IOT&E will be conducted leading to a production decision and Low Rate Initial Production (LRIP) contract award. Follow-on modification and integration efforts for other platforms will commence to include the F-16, F-15, E-3A, F-4 and other ground systems. Full production and installation of other platforms will continue. Major efforts will be devoted to incorporation of new technology devices to improve performance and ease integration into various platforms.

C. (U) Major Milestones:

Milestones	Dates
(1) TAF ROC 321-75	May 76
(2) Start System Design	Jan 78
(3) Start ADM	Mar 79
(4) Complete ADM	Aug 80
(5) Start FSD	Jan 81
(6) AFSARC Level Review	Jun 82
(7) DSARC Level Review	Jul 82
(8) MAJIC Study	Aug-Dec 82
(9) AFSARC Level Reviews	Dec 82/Jan 83
(10) DSARC Level Review	Mar 83
(11) Report to Congress	Mar 83
(12) Restart FSD	Apr 83
(13) Complete FSD	3Q FY86
(14) DT&E/IOT&E Start	1Q FY86
(15) DT&E/IOT&E End	3Q FY86

Program Element: #27423F
DoD Mission Area: #345 - Tactical Communications

Title: Advanced Communication Systems
Budget Activity: #4 - Tactical Programs

(16)	Production Decision	4Q FY86
(17)	Start Low Rate Initial Production	4Q FY86
(18)	Initial Production Deliveries	2Q FY87
(19)	Initial Operational Capability	2Q FY88

Budget Activity: Tactical Programs, #4
Program Element: #27423F, Advanced Communications Systems

Test and Evaluation Data

1. Development Test and Evaluation (DT&E): The purpose of SEEK TALK is to add jam resistant voice communication capability to the existing Air Force Ultra High Frequency (UHF) voice radios used in Tactical Air Operations by using spread spectrum techniques. In May 1982, the SEEK TALK program was redirected to include technical modifications recommended as a result of the Anti-Jam Architecture Working Group (AJAWG) Study. This modifed version of SEEK TALK includes [ ]

The spread spectrum capability is obtained by employing a National Security Agency developed Anti-Jam Code Module which provides a direct-sequence pseudo-random spread spectrum waveform. The antenna nulling feature of SEEK TALK is retained as an option to the modified version SEEK TALK.

(U) The SEEK TALK program was divided into two phases, Concept Validation and Full Scale Development (FSD). The Concept Validation phase was completed as a competitive program commencing with four contractors and terminating with two contractors, Hazeltine Corporation, Greenlawn, N.Y., and General Electric Company, Utica, N.Y. Both contractors built Advanced Development Models (ADM) to be tested at the Rome Air Development Center (RADC), N.Y., and at Eglin Air Force Base, FL.

(U) The ADM equipment was functionally but not physically similar to proposed production units. Both contractors' ADM equipment underwent detailed laboratory performance verification and vulnerability testing at RADC. Testing on the RADC Newport Antenna Range was conducted on a pedestal mounted A-10. Concept Validation DT&E flight tests were conducted at Eglin Air Force Base by the 4950th Test Wing, and RADC.

ADM testing was completed at Eglin Air Force Base in fourth quarter FY 81 and it validated the SEEK TALK concept. A shortfall from ADM performance goals occurred in spread spectrum modems. SEEK TALK System Program Office analysis indicated that performance objectives could be met with design changes in the correlation section of the modems with low risk. Antenna null steering met ADM performance goals. Predictably, [ ]

ADM Electromagnetic Compatibility (EMC) testing was completed at Fort Campbell, KY, in the fourth quarter FY 81 to measure interference effects between SEEK TALK and the AN/GRC-103 Army radio relay equipment. [ ]

Budget Activity: Tactical Programs, #4
Program Element: #27423F, Advanced Communications Systems

[ ]

E-3A Cosite Interference testing was conducted on the ground and in the air at Tinker Air Force Base, OK, in the first quarter FY 82 to measure the intermodulation production (IMP) effects due to the operation of multiple spread spectrum systems in the E-3A airframe. [ ] Data from the IMP test, along with data from an E-3A radio usage analysis were evaluated to determine the optimum number of SEEK TALK radio sets that can be employed on an E-3A.

(U) SEEK COMM flight testing was completed at Rome Air Development Center (RADC) in the fourth quarter FY 82 to verify that performance of SEEK COMM equipment in real world conditions was consistent with laboratory predictions. SEEK COMM, a backup technology for SEEK TALK developed by Massachusetts Institue of Technology Lincoln Laboratory employs increased power and frequency hopping of a spread spectrum UHF signal to obtain jam resistance. Initial test results indicate the equipment performed as well as, if not better than, expected and obtained the expected levels of jam resistance. Final test reports are expected in time to support Air Force Systems Acquisition Review Council (AFSARC) and Defense Systems Acquisition Review Council (DSARC) level reviews Dec 82-Jan 83 timeframe.

2. (U) Operational Test and Evaluation

a. The Air Force Test and Evaluation Center (AFTEC) conducted an operational effectiveness assessment of the ADM equipment at Eglin Air Force Base, Florida, from April to August 1981. The tests were conducted by an AFTEC anti-jam communications test team consisting of AFTEC and Tactical Air Command personnel. The equipment was operated by Air Force and maintained by contractor personnel. The equipment's design was functionally but not physically representative of that planned for production. The Master Timing Distribution Segment which maintains and distributes system time to all SEEK TALK-equipped airborne and surface elements was not available for the test. Only a five-element adaptive antenna system was used on the test aircraft versus the seven-element system intended for production. [ ]

b. The results of the assessment are summarized in a SECRET report titled SEEK TALK Advanced Development Model Terminal Operational Effectiveness Assessment Test Report, published by AFTEC in February 1982. The performance of the two contractor's equipment revealed some technical limitations which could be resolved by design changes while there were others which could not. [

]

Budget Activity: Tactical Programs, #4
Program Element: #27423F, Advanced Communications Systems

[

] The AFTEC report recommended a study to determine the amount of bandwidth required. [

] Testing of the modified SEEK TALK system is planned for fiscal year 1986 at Eglin Air Force Base using operational aircraft and ground elements in tactical scenarios.

3. Systems Characteristics. To validate SEEK TALK system technology, performance goals were established for ADM testing. Rome Air Development Center (RADC) conducted the ADM test as the responsible test organization. Data generated by the ADM test was reduced by the 4950th Test Wing at Wright-Patterson Air Force Base, OH, and analyzed by RADC. Reliability, maintainability, and availability were not evaluated during ADM testing and the respective production goals below are for the Tactical Airborne Segment.

Characteristic	ADM Goal	Demonstrated	Production Goal
Adaptive Antenna Array Gain	[	[	[
Spread Spectrum Modem Gain	]	]	]
Reliability	N/A	N/A	611 MTBF
Maintainability (ORG)	N/A	N/A	.20 hours
(INT)	N/A	N/A	1.00 hours
Availability	N/A	N/A	[ ]

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #27431F (64701F) (27415F) (64751F)

Title: Tactical Air Intelligence System (TAIS) Activities

DOD Mission Area: #342 - TIARA Capabilities Developments

Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	10,278	8,243	1,482	6,514	Continuing	N/A
2387	Intra-Theater Imagery Transmission System (IITS)*	0	1,091	910	1,000	1,800	10,188
2394	Operational Application of Special Intelligence Systems (OASIS)	10,083	7,052	0	0	0	40,231
2514	Imagery Interpretation (II)	23	85	0	0	0	10,508
2516	Display and Control/Storage and Retrieval (DC/SR)	52	15	0	0	0	42,967
2604	United States Air Forces in Europe Tactical Air Intelligence System (UTAIS) Architecture	120	0	0	0	0	2,420
2904	RDJTF Support	0	0	572	300	1,700	2,572
2928	Tactical Intelligence Requirements - Europe	0	0	0	5,214	18,220	23,434

* $487 thousands in FY 82 was funded in PE 64751F (total R&D costs through FY 82 is $5,387 thousands); IITS transferred to PE 27431F beginning in FY 83.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The tactical forces are faced with a critical deficiency in their capability to rapidly and accurately process, interpret, and disseminate information from various intelligence collection systems. The purpose of this program is to develop and acquire mobile, land-based processing, interpretation, exploitation and dissemination systems for use by tactically deployed general purpose forces.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in Thousands)

RDT&E	9,066	8,253	7,811	Continuing	N/A
Procurement (Other)	6,281	9,316	3,661	15,419	46,047

(U) The increase in RDT&E funding in FY 1982 reflects additional funding within Project 2394, OASIS, to accelerate completion of program tasks. The decrease in FY 1984 reflects a combination of the decision to complete Project 2394, OASIS, within the FY 1983 funding, decreases in travel funds, a share of congressionally directed undistributed RDT&E reductions, and inflation adjustments. The decrease in procurement funding in FY 1982 reflects the reprogramming of

Program Element: # 27431F (64701F) (27415F) (64751F)   Title: Tactical Air Intelligence System (TAIS) Activities

DOD Mission Area: #342 - TIARA Capabilities Developments   Budget Activity: #4 - Tactical Programs

funds, within the Program Element, from Project 2387, IITS, to partially satisfy the requirements of the project now shown as Project 2904, RDJTF Support. Decrease in FY 1983 reflects the partial deletion of funding for Project 2516, DC/SR, by Congress. Decrease in FY 1984 reflects a decrease in funding and quantities procured within Project 2387, IITS. Total Estimated Costs for procurement decreases as a result of the combination of the above reasons.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	Operations and Maintenance (3400)						
2394	Operational Application of Special Intelligence Systems (OASIS)	3,882	6,313	0	0	0	27,495
2514	Imagery Interpretation (II)	1,996	1,462	0	0	0	6,432
2904	RDJTF Support	680	1,900	800	800	1,100	6,480
2928	Tactical Intelligence Requirements - Europe	0	0	0	1,100	3,200	4,300
	Procurement (Other) (3080) (Quantity)						
	Intra-Theater Imagery Transmission System (IITS)	5,734 (24)*	4,516 (26)	1,040 (6)	756 (4)	4,419 (25)	16,465 (85)*
	Imagery Interpretation (II)	0	3,500	0	0	0	3,500
	Display and Control/Storage and Retrieval (DC/SR)	720	0	0	0	0	6,890
	Tactical Intelligence Requirements - Europe	0	0	0	7,299	7,609	14,908

* (U) Includes nine (9) commercial equivalent facsimile transceivers for RDJTF and MAC.

5. (U) RELATED ACTIVITIES: The Tactical Information Processing and Interpretation (TIPI) System, PE 64701F, Project 2514, Imagery Interpretation (II) and Project 2516, Display and Control/Storage and Retrieval (DC/SR), was transferred to this Program Element in FY 1979. The TIPI program is providing mobile land-based facilities only and is complimentary to Navy programs which provide similar capabilities aboard ships. The program is managed by a jointly manned Program Office. Each service (Army, Marine Corps and Air Force) budgeted separately for production, but the procurements are centrally managed by the Program Office. Technology developed within this program will be incorporated into the Intelligence Analysis Center (IAC) of the Marine Air Ground Intelligence System (MAGIS) under PE 26626M, Project C0062-CC, with procurement being managed by the Program Office. The Tactical Digital Facsimile transceiver, which is to be used in the Intra-Theater Imagery Transmission System (IITS), is being developed for the Joint Tactical Communications (TRI TAC) Program by the Navy under Program Element 28020N, Project XO 723-CC. PE 64751F, Project 2387, IITS transferred to this

Program Element: #27431F (64701F) (27415F) (64751F) Title: Tactical Air Intelligence System (TAIS) Activities

DOD Mission Area: #342 - TIARA Capabilities Developments Budget Activity: #4 - Tactical Programs

Program Element in FY 1983. PE 27415F, Project 2394, OASIS transferred to this Program Element in FY 1982. RDT&E funds to develop the Air Force Enemy Situation Correlation Element (ENSCE), a facility to perform multisource correlation and provide near-real-time targeting data and battlefield status information to tactical field commanders were transferred to PE 64321F, Joint Tactical Fusion Program in FY 1981.

6. (U) WORK PERFORMED BY: Air Force management is provided by Electronic Systems Division, Hanscom AFB, MA, supported by Rome Air Development Center, Griffiss AFB, NY, and Aeronautical Systems Division, Wright-Patterson AFB, OH. Contractors are: Litton Amecon Corpor tion, College Park, MD (Tactical Digital Facsimile transceiver for IITS); Martin Marietta, Denver, CO (OASIS); Texas Instruments, Inc., Dallas, TX (II); and Radio Corporation of America, Burlington, MA (RDJTF Support). The MITRE Corporation, Bedford, MA (OASIS and IITS) and General Electric Corporation, Daytona Beach, FL (II and DC/SR) provide technical support to the project office.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project 2387 - Intra-Theater Imagery Transmission System (IITS): The IITS project will develop and acquire facsimile transceiver terminals to provide timely, secure transmission of high priority reconnaissance imagery over Defense Communications System and tactical communications to command and control centers, mission planners and strike crews. Use of these transceivers will greatly improve the delivery of time sensitive target imagery to the strike crews and will relieve from courier duty, aircraft, crews and fuel currently used to distribute priority imagery. Timely imagery support will enhance ordnance and tactics selection, as well as target orientation for the strike crews. Upon completion of the Initial Operational Test and Evaluation (IOT&E), in FY 1982, the prototype equipment was provided to United States Air Forces in Europe (USAFE) to provide them an Interim Operational Capability. USAFE will continue to operate the system at seven locations in Germany and the United Kingdom (Ramstein Air Base, GE; Spangdahlem Air Base, GE; Zweibrucken Air Base, GE; NATO Support Center, Kalkar, GE; Shierstein, GE; Royal Air Force Base Lakenheath, UK, and; Royal Air Force Base Alconbury, UK), using existing AUTOVON circuits, until these prototype terminals can be replaced with production units. As a result of this hardware's proven capability, one other terminal, originally located at Ramstein Air Base during the IOT&E, has been loaned to the Joint Chiefs of Staff to support the Strategic Arms Reduction Talks in Geneva, Switzerland. Also during FY 1982, the design and acquisition of nine commercial equivalent facsimile transceivers for the RDJTF and Military Airlift Command (MAC) to meet immediate operational requirements was begun. These terminals are also intended to provide only an Interim Operational Capability and are programmed to be replaced with the militarized and logistically supportable production units. In FY 1983, the design of the production unit IITS terminals and the procurement of the Tactical Digital Facsimile (TDF) devices through the TRI TAC Program will begin, and acquisition of the RDJTF and MAC terminals will continue. In FY 1984, the acquisition and installation of the RDJTF and MAC terminals and the production terminal design will be completed, and the design of transit cases for the hardware will begin. Cost estimates are based on actual equipment costs and experience of the Air Force Systems Command Program Office with similar development programs and are as of November 1982.

B. (U) Project 2394 - Operational Application of Special Intelligence Systems (OASIS): The OASIS project provides evolutionary improvements, in both hardware and software, to the United States Air Forces in Europe's Tactical Fusion Center (TFC) in the NATO Operations Center for the Allied Air Forces Central Europe. These enhancements are necessary to correct serious deficiencies in the ability to provide the Commander-in-Chief, United States Air Forces in Europe

Program Element: #27431F (64701F) (27415F) (64751F)   Title: Tactical Air Intelligence System (TAIS) Activities

DOD Mission Area: #342 - TIARA Capabilities Developments   Budget Activity: #4 - Tactical Programs

(USAFE), a complete, integrated air and ground situation assessment, based on both North Atlantic Treaty Organization's operations data and data from United States special intelligence sources. This will allow him to effect responsive command and control in his wartime role as Commander, Allied Air Forces Central Europe. In FY 1982, the installation and checkout of the basic data distribution system was completed, development of message handling enhancements continued, and development of a capability to receive data in the TFC computer from the NATO Operations Center computer and a two-way communications link between the TFC and the USAFE Combat Operations Intelligence Center at Ramstein AB, GE were begun. The latter three tasks will be continued in FY 1983. In addition, the existing operator consoles and the closed-circuit TV system will be converted to color and two additional consoles will be added to the NATO area. Completion of these tasks will end the project.

C. (U) Project 2514 - Imagery Interpretation (II) Segment: The II segment of the Tactical Information Processing and Interpretation (TIPI) system is comprised of three shelters containing automated equipment and communications to enable a photo interpreter to rapidly and accurately extract and disseminate information from tactical reconnaissance imagery. In FY 1982, the final Air Force II segments were delivered. Correction of residual discrepancies will continue through FY 1983.

D. (U) Project 2516 - Display and Control/Storage and Retrieval (DC/SR) Segment: The DC/SR segment of the TIPI system is a six shelter complex containing the automated equipment and analysts' consoles necessary to enable intelligence personnel in a Tactical Air Control Center to correlate intelligence data from all sources and to perform intelligence analysis, threat assessment, collection management and target planning in a timely manner. Correction of residual discrepancies will continue through FY 1983.

E. (U) Project 2604 - United States Air Forces in Europe Tactical Air Intelligence System (UTAIS) Architecture: This project, which provided a functional system description of the current UTAIS and the specification for the mainframe computer replacement for the USAFE Combat Operations Intelligence Center, was completed in early FY 1982.

F. (U) Project 2904 - RDJTF Support: This project provides for the expedited acquisition of a Deployable Intelligence Data Handling System (DIDHS) for the RDJTF. The baseline capability consists of an Army-developed AN/TSQ-130(V) shelterized/mobilized system with a modified Korean Air Intelligence System software package. One unit with a maintenance van was procured in FY 1982 and delivered in early FY 1983. Spare parts will also be delivered in FY 1983. In both FY 1983 and FY 1984, the contractor will continue hardware and software maintenance and tailoring of the software to the RDJTF requirements. The system will then transition to government maintenance. This is not a new start project; initial RDT&E funding in FY 1984 reflects compliance with revisions to AFM 172-1 that require development of software to be funded with RDT&E funds. This effort was previously funded solely with procurement and operations and maintenance funds. The cost estimates are based on the experience of the Air Force System Command Project Office with similar development programs and are as of August 1982.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #27595 Title: Base Communications-Tactical Air Forces
DOD Mission Area: #360 - Support and Base Communications Budget Activity: #04 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
2941	Assured Logistics Communications	0	0	480	950	2,394	3,824

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Element provides base communication support to Tactical Air Force. Improvements are needed to assure communications support for wartime logistics command and control.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands) N/A

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Operations and Maintenance Funds	0	0	300	1,200	6,500	8,000
Other Procurement Funds	0	0	200	700	7,500	8,400

5. (U) RELATED ACTIVITIES: None

6. (U) WORK PERFORMED BY:

RDT&E effort will be accomplished by Headquarters Electronic Systems Division.

Program Element: #27595 Title: Base Communications-Tactical Air Forces
DOD Mission Area: #360 - Support and Base Communications Budget Activity: #04 - Tactical Programs

7. (U) ASSURED LOGISTICS COMMUNICATIONS (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984)

A. (U) Project Description:

Provides assured wartime communications to critical logistics information/data for direct wartime combat support. Funds requirements determination and development effort to provide assured communications for USAFE, PACAF and deployed logistics activities by providing access to alternate back up paths for critical logistics communications. Dollars provide for determining network/ADP communications requirements and providing user terminals and access lines to alternate networks. Existing communications available for logistics have serious documented wartime shortfalls. Without assured logistics communications to support the command and control of critical logistics resources, combat forces cannot be sustained in wartime. This is a readiness and sustainability initiative.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) (U) FY 1982 Accomplishments: N/A

(2) (U) FY 1983 Program: N/A

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request:
Initiate RDT&E effort to develop alternate wartime communications paths for critical logistics data and information. Funding is to complete a network design and provide the information necessary to obtain access to alternate, back up communications networks (e.g. Public Data Network).

(4) (U) Program to Completion:
Project will provide alternate wartime routing of critical logistics support information for combat forces in Europe, Pacific and other deployed locations. Networks identified for USAFE are Movements Information Network (MINET) and Public Data Networks (PDN). Both networks selected as a result of OSD/JCS research and were recommended in Defense Audit Services report on Wartime Logistics Communications. Funding will develop similar efforts in PACAF and for deployed forces.

Program Element: #27595
DOD Mission Area: #360 - Support and Base Communications

Title: Base Communications-Tactical Air Forces
Budget Activity: #04 - Tactical Programs

C. (U) Major Milestones:

EVENT	DATE
Establish System Program Office at Electronic Systems Division	3rd QTR/FY 83
Begin Theater and Theater to CONUS Logistics Communication Requirement Determination and Network Design	1st QTR/FY 84
Complete Theater and Theater to CONUS Logistics Communication Requirement Determination and Network Design	3rd QTR/FY 84
Begin Network Development and Integration in USAFE/PACAF	1st QTR/FY 85

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 28010F
DOD Mission Area: #345 Tactical Communications

Title: Joint Tactical Communications (TRI-TAC)
Budget Activity: #4 Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	25,851	47,860	25,794	8,153	Continuing	Not Applicable
2260	Communications Nodal Control Element	10,052	18,900	14,600	3,200		
2264	Digital Nonsecure Voice Terminal	600	-	-	-		
2266	Digital Troposcatter Terminal	1,500	2,600	2,100	500		
2267	Test	3,700	4,900	3,700	1,900		
2270	Support	3,700	9,200	5,394	2,553		
2804	Communications System Control Element	6,299	7,400	-	-		
2852	C^3 UPGRADES	-	4,860	-	-		

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The objective of this program is the development of secure anti-jam digital communications equipment for use in a tactical environment. Equipment developments center around trunking and switching equipment, system control facilities, local distribution equipment, terminal devices, and interface equipment. The effort seeks to achieve economy through joint participation and centralized acquisition of tactical equipment.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

RDT&E	26,899	52,875	22,661

FY 1983 decreased $5M due to a congressional adjustment. FY 1984 increased by $4M due to a USDR&E Program Budget Decision (#252R) to provide funds necessary to upgrade the Communications Nodal Control Element for Army unique requirements. Project 2852, C^3 Upgrades, funding has been realigned into the appropriate projects which it supports. Change in project 2804 in FY 1983 was a result of internal Air Force realignment of funding between projects. Increase in the Support line in FY 1983 and FY 1984 provides for the development of ancilliary equipment and logistics support items which are critical for the fielded TRI-TAC system.

4. (U) OTHER APPROPRIATION FUNDS:

	FY 1982	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Estimate Costs
Procurement (Other) (With Spares)	114,091	135,068	185,978	169,943	Continuing	Not Applicable

Program Element: #28010F
DOD Mission Area: #345 Tactical Communications

Title: Joint Tactical Communications (TRI-TAC)
Budget Activity: #4 Tactical Programs

5. (U) RELATED ACTIVITIES: Program Element 28010F is conducted by all the Services under the overall direction of the office of Deputy Undersecretary of Defense, Command, Control, Communications and Intelligence, and the guidance of the TRI-TAC Office, Fort Monmouth, NJ. It is related to programs within the Defense Communications System which are more "strategic communications" oriented and to programs within National Security Agency for communications security resources. The objective is to ensure sufficient coordination to prevent duplication of effort and to permit standardization of interfaces where feasible.

6. (U) WORK PERFORMED BY: The Air Force Systems Command manages the Air Force portion of this program through the Electronics Systems Division, Hanscom AFB, MA, and Rome Air Development Center, Griffiss AFB, NY. Current contractors include: Martin-Marietta Corporation, Orlando, FL (TCCF); Raytheon, Sudbury, MA (TROPO); ECI, St. Petersburg, FL Magnavox, Atronics General (DNVT); Analytical Systems Engineering Corporation, Burlington, MA (Support); and MITRE Corporation, Bedford, MA (Support).

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 2266 Digital Troposcatter Terminal. This system will provide long range wideband communications in a tactical environment. The system entered production in FY 1982, and first deliveries are expected in FY 1984. The continuing R&D effort is to provide an anti-jam capability for the system.

B. Project: 2267 Test. Testing is performed by the Joint Test Element at Ft. Huachuca, Arizona. Testing in FY 82 was performed on the RDT&E assets of the TRI-TAC system to verify interoperability. Testing will continue as the TRI-TAC system evolves.

C. Project: 2270 Support. This project covers the MITRE and basic required program office support. In addition this project provides for TTC/TYC-39 test/support equipment and manuals, TRI-TAC system user's guide, interface devices, expansion of TTC-42 switch capability, system integration/transition planning, interim Short Range Wideband Radio, Initial Operational Test support, and support by the Rome Air Development Center. Support will continue into production and fielding of the USAF developed items of the TRI-TAC system.

8. (U) PROJECTS GREATER THAN $10M IN FY 1984:

A. Project: 2260 Communications Nodal Control Element. This element of the TRI-TAC system assigns, monitors, controls, and manages resources at a communications node. The hardware and software of this system will support the family of TTC-39 switches being developed by the US Army.

B. (U) Program Accomplishments and Future Efforts:

1. (U) FY 1982 Accomplishments: Development contract for the Tactical Communications Nodal Control Element was awarded in May, 1975. The Communications Nodal Control Element completed testing this fiscal year. The Communications Nodal Control Element (one of three) was delivered to the Joint Test Facility at Ft. Huachuca, AZ in January, 1979 to begin Service testing. Developmental testing/operational testing of this system began in June, 1980, and was completed in October, 1981.

Program Element: # 28010F
DOD Mission Area: #345 Tactical Communications

Title: Joint Tactical Communications (TRI-TAC)
Budget Activity: #4, Tactical Programs

2. (U) FY 1983 Program: Production is scheduled to begin in July, 1983 with a four-year multiyear contract.

3. (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: RDT&E will continue and will provide CNCE software upgrade, training simulator, software maintenance facility and peculiar support equipment. In addition an upgrade will be performed for the Army which involves replacing the present processor and replacing the data bus controller with an communications interface controller (for high speed transfer of data to other elements of the TRI-TAC system).

4. (U) Program to Completion: First deliveries are expected in FY 1985. The production contract will continue through FY 1987. A follow-on contract is expected.

C. (U) Major Milestones:

Milestones		DATE
Contract Award		May 1975
Preliminary Design Review - Hardware		Dec 1975
Preliminary Design Review - Software		Aug 1976
Critical Design Review - Hardware		Apr 1977
Critical Design Review - Software Part I		Aug 1977
Part II		Jan 1978
Contractor Development Testing		Sep 1977 - Dec 1978
Variant Development		Jul 1979 - Dec 1983
Software Delivery		Jun 1980
Service Testing Began		Aug 1980
Service Testing Completed		Oct 1981
Production Begins	(Dec 1982)	Jul 1983

(U) EXPLANATION OF MILESTONE CHANGES

The production of this system slipped by about six months due to efforts required to correct deficiencies prior to production.

Budget Activity Tactical Programs, #4
Program Element #28010F, Joint Tactical Communications (TRI-TAC)

Test and Evaluation

1. (U) Development Test and Evaluation: The Joint Tactical Communications (TRI-TAC) program is a joint Service program with each Service responsible for the development of assigned equipment. The United States Air Force has been assigned four items; the Tactical Communications Control Facility is a major item. This report presents the overview. Each Service and National Security Agency is also responsible for the development, test and evaluation of equipments tasked by the Department of Defense. Individual test plans including interface parameters are coordinated with the TRI-TAC Office. Initial developmental testing will be conducted in-plant by the developing contractor. Developmental Testing and Evaluation will include hardware integration testing, Communications Security, integration, reliability and maintainabity, and acceptance testing of peripheral equipment. Joint developmental and initial operational testing of Air Force developed TRI-TAC equipments was initiated in June, 1979 by the Joint Test Organization at Fort Huachuca, Arizona. The contractor for the Communications Nodal Control Element of the Tactical Communications Control Facility is Martin-Marietta, Orlando, FL. The contractor chosen for the Communications System Control Element is Systems & Applied Sciences Corporation, Riverdale, MD. The Raytheon Co., Sudbury, MA is the prime contractor for the Digital Troposcatter Terminal. The contractors for the Digital Nonsecure Voice Terminal are Magnavox and E-Systems. All developmental testing has been completed the troposcatter system is presently in production and the Digital Nonsecure Voice Terminal and Communications Nodot Control Element will enter production in November 1982 and April 1983 respectively.

2. (U) Operational Test and Evaluation: TRI-TAC test and evaluation is being conducted as a multiservice combined development test and evaluation/initial operational test and evaluation program. The acquisition service/agency has overall responsibility for operational test and evaluation of each of the TRI-TAC equipments. Full-scale engineering development models of each TRI-TAC equipment are operated and maintained by Army, Navy, Marine Corps, and Air Force personnel during initial operational testing. These personnel are selected from the using commands and agencies on the basis of specialty codes expected to be used during operational equipment deployment. Testing will be conducted primarily at Fort Huachuca, Arizona, with some interface testing planned at the Naval facility in San Diego, California.

(U) The Air Force Test and Evaluation Center has operational test and evaluation responsibility for the Digital Nonsecure Voice Terminal, Digital Troposcatter Radio Terminal (AN/TRC-170), and the Tactical Communications Control Facility. The Tactical Communications Control Facility comprises the Communications Nodal Control Element and the Communications System Control Element.

(U) The Short Range Wideband Radio(SRWBR) development effort has not been funded. ESD is evaluating commercial microwave radios as an interim solution. SRWBR test planning has been deferred until further evaluation is conducted on the commercial system.

(U) The Digital Nonsecure Voice Terminal full-scale development contract awards were made in July 1980 to General Atronics Corporation (Magnavox) and E-Systems, Incorporated. Joint developmental/operational testing was conducted during for the period November, 1981 through January, 1982. Initial operational test planning was coordinated

Budget Activity Tactical Programs, #4
Program Element #28010F, Joint Tactical Communications (TRI-TAC)

Test and Evaluation

with the United States Army Operational Test and Evaluation Agency, United States Naval Operational Test and Evaluation Force United States Marine Corps Operational Test and Evaluation Activity, National Security Agency, Defense Communications Agency, and United States Air Force using and supporting commands. Production contract is scheduled for November 1982.

(U) The Initial Operational Testing and Evaluation of the AN/TRC-170 was completed in October, 1980, and the Air Force Test and Evaluation Center report TRI-TAC AN/TRC-170 ( )(V) Tropo IOT&E Report was dated December 1980. The Air Force Test and Evaluation Center recommended a favorable production decision provided that minor discrepancies are corrected to improve reliability and antenna mobility, and that instrumentation be incorporated into the development models and the system be retested before delivery of production equipment to the field. The production contract was awarded in April 1982.

(U) The Communications Nodal Control Element initial operational test plan was coordinated with all service test agencies, the National Security Agency, the Defense Communications Agency, and the Air Force using and supporting commands. Joint developmental/operational testing began in June, 1980, and was completed October, 1981. Air Force Test and Evaluation report is dated January, 1982. Following testing, several hundred deficiencies were identified, and a program was begun to correct the deficiencies. A Special Program Review was held in October 1982 in which ten deficiencies were identified as still remaining open. During this meeting, a plan was presented and accepted to correct all remaining deficiencies concurrent with production. An Army in progress review is scheduled for January 1983 with a production decision to follow. Contract award is scheduled for April 1983.

(U) The Communications System Control Element contract award for full-scale development was in February 1982, but the formal IOT&E planning has not been accomplished pending OSD decision regarding lead Service responsibility. Initial plans call for an integrated test at Ft Huachuca, Arizona with the other items of TRI-TAC equipment in the early 1975 time frame.

(U) The United States Army Operational Test and Evaluation Agency has operational test and evaluation responsibility for the AN/TYC-39 message switch, AN/TTC-39 circuit switch, digital group multiplexer, mobile subscriber equipment, mobile record traffic terminal, and net radio interface. Air Force Test and Evaluation Center is participating in testing and test planning for those TRI-TAC equipment items which are programmed to enter the Air Force Inventory. There was no Air Force participation planned for the Net Radio Interface or Mobile Subscriber Equipment initial operational testing.

(U) Four AN/TYC-39 message switches were tested from February, 1979, through May, 1980. During the test, the AN/TYC-39 showed the potential to provide a significant improvement in message throughput, decreased operator workload, and message traffic accounting. Defense Systems Acquisition Review Council milestone III was in March, 1980, and recommended production of the AN/TYC-39. The Air Force Test and Evaluation Center report was dated October, 1979. Production contract was awarded in September, 1980. (GTE Sylvania).

Budget Activity Tactical Programs, #4
Program Element #28010, Joint Tactical Communications (TRI-TAC)

Test and Evaluation

(U) Four AN/TTC-39 circuit switches were tested from 13 November, 1979, to 20 May, 1980. Although deficiencies were discovered, the July, 1980, Defense Systems Acquisition Review Council milestone III recommended production. Because the software tested in the AN/TTC-39 was not the software to be procured, additional testing was planned from November, 1980, to February, 1982, to test the operational software. The Air Force Test and Evaluation Center report is dated August, 1980. Production contract was awarded in September, 1980. (GTE Sylvania).

(U) Digital Group Multiplex equipment is currently being tested as integral parts of other individual TRI-TAC equipments. In addition, a separate Digital Group Multiplex Initial Operational Test was conducted by the Army and the Marine Corps from September through November 1980. Those elements of the Digital Group Multiplex family planned for Air Force use showed a potential to be operationally effective; however, their operational suitability was deficient. The production decision was in July 1981. The Air Force Test and Evaluation Center report TRI-TAC Digital Group Multiplex (DGM) IOT&E Air Force Evaluation Report was dated May 1981. Production contract was awarded in March 1982.

(U) The National Security Agency has test and evaluation responsibility for all communications security items being procured in the TRI-TAC programs. Except for the communications security equipment associated with the Advanced Narrowband Voice terminal, separate periods of initial operational testing and evaluation are not planned. The communications security equipment items are being tested in conjunction with intraoperability, interoperability, and communications security tests conducted during initial operational testing and evaluation of the parent equipment (e.g., AN/TYC-39, Nodal Control, Advanced Narrowband Digital Voice Terminal, etc.).

(U) The United States Marine Corps Operational Test and Evaluation Activity has operational test and evaluation responsibility for the Unit Level Switch program. The Unit Level Switch comprises three equipment items: an AN/TTC-42 Unit Level Circuit Switch, an SB-3865 switchboard, and an AN/GYC-7 Unit Level Message Switch. There are no Air Force plans to procure the AN/GYC-7. The AN/TTC-42 and SB-3865 will be simultaneously tested at the Fort Huachuca test bed. The Air Force Test and Evaluation Center is participating in initial operational test plan development with the Marine Corps Testing Agency, and Initial Operational Test & Evaluation is currently scheduled for February 1982 through November 1983. A production decision is scheduled for June, 1983.

(U) The Tactical Digital Facsimile initial operational testing and evaluation was conducted from April, 1981, through July, 1981 with the Air Force Test and Evaluation Center participating in the testing at Ft Huachuca, AZ. Test results indicated that operational performance was not satisfactory, and reliability, maintainability, and availability still require improvement. This program is being restructured by the Navy.

(U) The Advanced Narrowband Digital Voice Terminal is in the full scale engineering development phase. The Air Force Test and Evaluation Center will participate in operational test plan development with the United States Naval Operational Test and Evaluation Force. Initial operational testing and evaluation is scheduled from November, 1983 through April, 1984. Initial operational testing and evaluation of the communications security equipment associated with the Advanced Naroowband Digital Voice Terminal is scheduled from August 1982 to May 1983. A production decision is scheduled for July, 1984.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #35887F
DOD Mission Area: 374, Multimission, Technology & Support

Title: Electronic Combat Intelligence Support
Budget Activity: 4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	Total for Program Element	0	2623	1840	1955	CONT	N/A

2. BRIEF DESCRIPTION OF ELEMENT & MISSION NEED: Electronic Combat (EC) Intelligence Support RDT&E funds support the development of the Electronic Warfare (EW) Support Data Base and the Threat Simulator Validation (SIMVAL) program. This is a high priority USAF project that was previously funded by PE 64735F. [

] The SIMVAL program ensures that threat simulators under development are accurate replicas of threat emitters. Threat simulators are employed to evaluate the effectiveness of warning receiver and countermeasures systems. In addition, it provides a realistic threat environment during MAJCOM and interservice exercises. Without this program, electronic combat equipment development and aircrew training would be severely degraded.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
RDT&F	1400	2700	1900	2100	CONT	N/A

4. (U) OTHER APPROPRIATION FUNDS:

Procurement (Other)	304	291	282	372	CONT	N/A

5 RELATED ACTIVITIES: This program supports all Electronic Combat Intelligence subjects. It interfaces with PE 28021F, Electronic Combat Support in the development of the [

] Program element includes SIMVAL, EW Data Base, C^3CM Data Base and a classified program.

Program Element: #35887F | Title: Electronic Combat Intelligence Support
DOD Mission Area: 374, Multimission, Technology & Support | Budget Activity: 4, Tactical Programs

6. (U) Work Performed by: The Foreign Technology Division (FTD) at Wright-Patterson AFB, Ohio is responsible for EW Data Base development using in-house and contract resources. Current Electronic Warfare Integrated Reprogramming (EWIR) Data Base development is being accomplished by Planning Research Corporation (PRC) field office at Dayton, Ohio. FTD is also responsible for the threat simulator validation program for new simulators under development. This work is currently accomplished by Applications Research Corporation (ARC), Dayton, Ohio.

7. (U) Electronic Combat Intelligence Support (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984):

A. Project Description: The USAF has a current [

] The Threat Simulator Validation Program insures that the threat system simulators provide signal characteristics comparable to the enemy threat. This is accomplished using the most current intelligence (Intelligence Data Input Package) with the simulator under design. Fielded threat simulators are used in joint service exercises (Red Flag, Green Flag, Team Spirit), OT&E and DT&E programs. In addition, the Air Force Electronic Warfare Evaluation Simulator (AFEWES) has software simulations which are used for tests and evaluation which require valid simulations.

B. (U) Program Accomplishments and Future Programs:

(1) FY 1982 Accomplishments: [

]

(2) FY 1983 Program: Twenty simulators are scheduled for validation this year. [

] EW Data Base funds will provide for data base management system development to insure all sub-files within the EW Data Base are compatible.

Program Element: #35887F
DOD Mission Area: 374, Multimission, Technology & Support

Title: Electronic Combat Intelligence Support
Budget Activity: 4, Tactical Programs

(3) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Programmed funds will continue to develop the EW Data Base files and work towards communications capability for daily update of data elements. The following threat radar simulators are scheduled for validation. [

]

(4) Program to Completion: Continue the development of the EW Data Base to include [

] and the automation of the Intelligence Data Input Package (IDIP) production process at FTD. Continue to validate new simulators as they are acquired. Current rate is 6-10 per year.

C. (U) Major Milestones: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #41115F
DOD Mission Area: #228 - Intratheater Airlift

Title: C-130 Airlift Squadrons
Budget Activity: # 4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	14,944	688	465			24,897
2811	STOL Performance Improvements	13,400					22,400
2964	Modular Aerial Spray System		688				488
2965	Air Droppable Airfield Lighting			465			465

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The utility and flexibility of military forces are related directly to their strategic and tactical mobility. C-130 forces provide delivery of combat forces directly into an objective area both during and subsequent to the assault phase of an operation. They rapidly deliver sustaining supplies and equipment by either airlanding and offloading or by other delivery modes such as airdrop or LAPES (Low Altitude Parachute Extraction System). RDT&E of incremental product improvement to those C-130 aircraft engaged in missions other than tactical airlift is also provided in this program element.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	14,944	688	486	25,118

$1.544M was not obligated during FY 1982 for STOL Performance Improvements. This amount is being applied to FY 1982 program charges. Any remaining funds will be used for demodification.

$200K in FY 1983 for Modular Aerial Spray was reprogrammed as a funding solution for Liquid Cooling Vest/HAVE FLASH

$23K in FY 1984 for Air Droppable Airfield Lighting was removed due to inflation adjustment

Program Element: # 41115F
DOD Mission Area: #228 - Intratheater Airlift

Title: C-130 Airlift Squadrons
Budget Activity: # 4 - Tactical Programs

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Procurement (Base Maint and Support Equip) (PE #41115F)			1,600			1600
(Quantity)			(2,524)			(2,529)

5. (U) RELATED ACTIVITIES: Aircraft procurement funds for long lead materials have been included in the FY 1982 amended budget for a follow-on program identified as MC-130H, PE #27241F. The MC-130H program provides for twelve aircraft to satisfy recently revealed shortfalls in the size and capability of our special operations force. NASA is providing technical assistance to determine if the air flow pattern surrounding the C-130 aircraft is suitable for the aerial spray mission.

6. (U) WORK PERFORMED BY: Air Force Systems Command's Aeronautical Systems Division, Wright-Patterson Air Force Base, Ohio is responsible for the management of the STOL improvement program. Principal contractors are: Lockheed-Georgia Company, Marietta, Georgia; International Business Machines, Federal Systems Division, Owego, New York; and Texas Instruments, Incorporated, Dallas, Texas. Warner Robins Air Logistics Center (WRALC) is responsible for the management of the aerial spray program. The aerodynamic feasibility study will be done under contract by Lockheed Georgia Company with assistance from NASA and the U.S. Park Service. It is anticipated that hardware design will also be accomplished by Lockheed under contract to WRALC. The tactical airfield lighting system effort will be managed by the Productivity, Reliability, A[illegible]ability, and Maintainability (PRAM) office of Aeronautical Systems Division.

7. (U) C-130 AIRLIFT SQUADRONS (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984)

A. (U) Project Description: Present and future tactical airlift operations require operations into austere areas. To conduct operations in these austere areas MAC combat control teams (CCTs) must exercise terminal control and provide reliable and effective aids for acquisition of Landing Zones, Drop Zones and Extraction Zones during combat airlift missions. Project will provide necessary design and engineering work in order to develop/procure an electroluminescent lighting system suitable for CCT use.

Program Element: # 41115F	Title: C-130 Airlift Squadrons
DOD Mission Area: #228 - Intratheater Airlift	Budget Activity: #4 - Tactical Programs

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The flight test program on the STOL aircraft was successfully completed in FY 4/82. Data reduction and final test report due in FY 2/83.

(2) (U) FY 1983 Program: Design and build a portable modular aerial spray unit that will fit in a C-130 aircraft. Conduct a very limited flight test to verify the ability of the C-130 to act as a spray platform using this modular equipment.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The FY 1984 program will design the packaging and accomplish pre-production engineering for electroluminescent (EL) lighting systems currently undergoing development testing. The lights are brighter, lighter, and easier to handle than current tactical airfield lighting equipment and will lead to safer night tactical airlift operations. Project will significantly increase Combat Control Team capabilities and overall mission effectiveness. Project will procure lights and place them in the operational inventory. This is a new start.

(4) (U) Program to Completion: Not Applicable.

C. (U) Major Milestones: Not Applicable.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #41118F
DOD Mission Area: #261 - Airlift

Title: C-141 Squadrons
Budget Activity: #4 - Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT*	0	0	3,194	1,363	271	4,828
2854	C-5/C-141 AERIAL REFUELING PART TASK TRAINER (ARPTT)		0	3,194	1,363	271	4,828

*C-5 funding for ARPTT is contained in PE 41119F.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The C-141 provides rapid worldwide airlift of personnel and supplies in support of DOD and national missions. Tanker support for training is limited and the Military Airlift Command does not have aircrew training devices for air refueling qualification and continuation training of the airlift pilot force. The air refueling part task trainer will ensure that the airlift force remains fully ready to perform its mission.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total
RDT&E	0	1,282	1,948		1,720	4,959
Procurement			1,500		19,800	21,300

Increase in FY 1984 RDT&E and decrease in procurement is due to reprogramming of ARPTT funds from production to RDT&E to support field of view requirements in prototype development. These funds were programmed for long lead items to support this procurement. Long lead funds are no longer required. The decrease in FY 3 is due to a reduction by the Dec 82 Senate/House Appropriation Conference on the FY 83 Defense Appropriation Bill. The decrease in the total program is due to revised inflation indices and other Congressional actions.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

		FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
2854	Procurement (Aircraft) 3010 (Program Element 41118F)				19.3		19.3
	(Quantity)				3		3
2855	Procurement (Aircraft) (Program Element #41119F)				19.9		19.9
	(Quantity)				3		3
	Military Construction 3300 (Program Element #41896F)				2.8	4.1	6.9
	(Quantity)				2	4	6

Program Element: #41118F
DOD Mission Area: #261 - Airlift

Title: C-141 Squadrons
Budget Activity: #4 - Tactical Programs

5. (U) RELATED ACTIVITIES: Cost for this development and procurement is shared with PE 41119, C-5 Squadrons.

6. (U) WORK PERFORMED BY: The design and development will be managed by the Aeronautical Systems Division of Air Force Systems Command. The contractor has not been selected.

7. (U) C-141 SQUADRONS (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984)

A. (U) Project Description: Use of aircraft for Military Airlift Command (MAC) C-5 and C-141 pilot air refueling (AR) training is expensive and requires dedicated support by the Strategic Air Command tanker force. Tanker support for training is limited, and MAC does not have aircrew training devices for AR qualification and continuation training of the airlift pilot force. Even if C-5 and C-141 flight simulators were adequately equipped, there is insufficient machine time available to satisfy AR training requirements. This project will provide a synthetic training device that provides the fundamental visual, audio, flight control, and buffet cues necessary for realistic AR training. It uses a common cockpit for both the C-5 and C-141 and will allow simulated air refueling with both KC-135 and KC-10 tankers. A total of seven (prototype and six production) trainers will be procured. This project is jointly funded with the C-5 program.

B. (U) Project Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: A draft Request-For-Proposal (RFP) was released to industry for comment. These comments were incorporated into the specification, model contract, and other contractual documents, and the final RFP was prepared for release to industry.

(2) (U) FY 1983 Program: Potential bidders will submit proposals on which to base source selection activities. Since the government is attempting to minimize risk and development by procuring components which are essentially off-the-shelf, each vendor will be required to provide a limited demonstration of his proposed visual system as part of the selection process. The contract will be awarded and contractor preliminary design activities initiated.

(3) (U) FY 1984 Planned Program: A mockup conference will be held to evaluate general arrangement and installation of equipment, seat excursion limits, location of the pilot and copilot eyepoints, and the interchangeability of the windscreen for both the C-5 and C-141 aircraft (a generic cockpit will be used to satisfy requirements for both aircraft). Both the Preliminary Design and Critical Design Reviews will be conducted. At these reviews, the contractor's design for the student station, instructor station, visual image generation and display, computational system, and software architecture firmware, his data development, and approach to logistic supportability will be assessed. Hardware and software integration will begin upon successful completion of these reviews.

(4) (U) Program to Completion: The prototype trainer will be fully integrated and ready for government in-plant qualification test in early FY 1985, at which time the production option for six additional trainers will be exercised. Delivery on site and acceptance testing will occur in the third quarter FY 86. All units will be delivered and ready for training by the end of FY 1987.

Program Element: #41118F
DOD Mission Area: #261 - Airlift

Title: C-141 Squadrons
Budget Activity: #4 - Tactical Programs

C. (U) Major Milestones:

Milestones	Dates
Release Request for Proposal	22 Oct 82
Contract Award	4th qtr FY 83
Preliminary Design Review	3rd qtr FY 84
Critical Design Review	4th qtr FY 84
Hardware/Software Integration	4th qtr FY 84 - 2nd qtr FY 85
Exercise Production Option	3rd qtr FY 85
Qualification Testing	3rd qtr FY 85 - 4th qtr FY 86
Delivery on Site	3rd qtr FY 86
Acceptance Testing	4th qtr FY 86
Prototype Ready-for-Training (OFT)	4th qtr FY 86
Production Unit #6 RFT	1st qtr FY 88

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #41119F
DOD Mission Area: #261 - Airlift,

Title: C-5 Wing Modification
Budget Activity: #4, Tactical Programs

1. (U) RESOURCES (BUDGET LISTING): ($ IN THOUSANDS)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	9,000	7,577	4,774	1,363	271	168,685
410A	C-5A Wing Modification Program	9,000*	6,300	1,500	0	0	162,500
2854	C-5/C-141 Part Task Trainer**	0	1,277	3,274	1,363	271	6,185

*6.5M reprogramming reduction ($15.5M to $9.0M).
**The C-5/C-141 Part Task Trainer program is described in the Descriptive Summary for PE 41118F, C-141 Airlift Squadrons.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The C-5A provides rapid worldwide airlift of personnel and supplies in support of DOD and national missions. It represents the only aircraft in the strategic mobility force capable of airlifting large "outsize" cargo. The C-5A Wing Modification Program will insure the future availability of the C-5A force by providing a wing life compatible with the remaining life of the non-wing structure of the aircraft. Except for the wing box structure, the 77 remaining C-5A aircraft will exceed the original 30,000 hour longevity goal. A modification is necessary to extend the aircraft service beyond the current 7100 hour safe life limit. This program is a continuation of SOR No. 214 dated 25 March 1964.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ IN THOUSANDS)

RDT&E	15,541	6,795	1,549	0.0	0.0	170,620
Procurement	186,500	190,200	239,100	0.0	0.0	865,300

(a) $15.5M of FY 82 RDT&E in FY 83 President's Budget reduced to $9.0M due to program cost reduction; no program changes resulted from reduced costs.

(b) Increase in Procurement (3010) in FY 84 from $239.1M to $246.1M due to program share of Independent Research and development (IR&D) costs.

Program Element: #41119F
DOD Mission Area: #261 - Airlift,

Title: C-5 Wing Modification
Budget Activity: #4, Tactical Programs

4. (U) OTHER APPROPRIATION FUNDS ($ IN THOUSANDS).

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
3400 (Installation)	48,600	109,500	102,700	105,700	112,800	479,300
3010	186,500	188,700	246,600	0.0	0.0	877,100
Quantities (Kits Delivered)	5	15	18	18	20	76*
Kits Installed	0	8	18	18	32	76*

*76 Wing Modification kits in addition to initial test aircraft (77 total).

5. (U) RELATED ACTIVITIES: C-5B Aircraft Procurement Program: The Air Force plans to procure 50 C-5B aircraft in addition to the present C-5A fleet. The C-5B aircraft will incorporate all modifications planned or completed on the C-5A aircraft including the C-5A wing modification. A preliminary C-5B contract with a $50M value was signed with Lockheed on 26 Oct 82. The first C-5B delivery will occur 38 months from the go-ahead date of 1 Nov 82.

6. (U) WORK PERFORMED BY: Lockheed-Georgia Corporation.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not applicable.

8. (U) C-5 WING MODIFICATION (SINGLE PROJECT OVER $10 MILLION IN FY 1984):

A. (U) PROJECT DESCRIPTION: The C-5A provides the only available outsize cargo airlift capability. Except for the original wing box structure, the 77 C-5A aircraft will exceed the original 30,000 hour longevity goal. A wing modification is necessary to extend the aircraft service life beyond the current 7100 hour safe life limit. This project involves the design and test of a new wing box structure followed by fabrication and installation into all C-5A aircraft. The production schedule is timed to prevent loss of outsize airlift capability during force retrofit.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) (U) FY 1982 Accomplishments: The wing fatigue test reached 90,000 Cyclic Test Hours (CTH) or three life-

Program Element: #41119 | Title: C-5 Wing Modification
DOD Mission Area: #261 - Airlift, | Budget Activity: #4, Tactical Programs

times in June 1982. The first production aircraft entered work during January 1982 and will be delivered in March 1983. RDT&E work is proceeding ahead of schedule and under cost.

(2) (U) FY 1983 Program: Fatigue testing of the wing will be terminated at 105,000 CTH (3.5 lifetimes). Eight aircraft wing modifications will be completed by the end of FY 83.

(3) (U) FY 1984 Planned Program and Basis for 1984 RDT&E Request: Residual strength testing, teardown inspection and a final test report will be completed following the completion of wing fatigue testing. Following completion of the teardown inspection in 1984, no further RDT&E funds (3600) are planned for the C-5A wing modification program. The aircraft modification schedule will continue to accelerate reaching a maximum of 1.5 aircraft per month during FY 84.

(4) (U) Program to Completion: After rate deliveries are achieved, the production flow will be set at 1.5 completions per month with the last aircraft modification being completed in FY 4/87.

C. (U) Major Milestones:

EVENT	DATE	EVENT	DATE
SOR No 214	Mar 64	Kit Fabrication (Cut Metal) Start	Aug 80
Design Contract Awarded (F33657-75-C-0178)	Dec 75	Complete DT&E/OT&E Flight Test	Dec 80
Critical Design Review	Nov 77	60,000 hour Fatigue Test Complete	Apr 81
AFSARC III Approval	Dec 79	Subassemblies for First Kit Available	Oct 81
Long Lead Funds Released	Jan 80	Fatigue Test Report Due	Dec 81
30,000 Hour Fatigue Test Complete	May 80	Complete FOT&E Flight Test	Feb 82
Milestone III Production Decision	Jun 80	Input First Production Aircraft	Feb 82
Kit Production (First Increment) on Contract	Jul 80	90,000 Hour Fatigue Test Completed	Jun 82
Start Limited (DT&E/OT&E) Flight Test	Aug 80	Output First Production Aircraft	Mar 83
		Rate Deliveries Begin	Feb 84
		Output Last Production Aircraft	Jul 87

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #41840F
DOD Mission Area: #261, Airlift; #131, Strategic C2

Title: MAC Command & Control (C2) System
Budget ACtivity: #4, Tactical Programs

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	-0-	3,300	3,327	1,871	Continuing	N/A

*FY 1983 funds are in PE 63735F (Worldwide Military Command and Control System Architecture) and funds were identified to PE 41840F starting in FY 1984 for better program definition.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: There is a significant airlift shortfall in support of all major operations plans. For MAC to make optimum use of our scarce airlift resources, a long overdue upgrade to the MAC command and control system is required. This program initiates action to develop and procure basic communications and information processing support for all C2 echelons of the MAC System.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY ($ in thousands) N/A. The MAC C2 System upgrade funds were not broken out separately, but were included, in the FY 1983 descriptive summary for PE 63735F.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Procurement (Other*)	-0-	2,050	5,350	10,400	Continuing	N/A

*Only that portion of the total procurement funding in PE 41840F dedicated to the MAC C2 System upgrade are shown above.

5. (U) RELATED ACTIVITIES: This program is designed to provide minimum essential C2 capability at all echelons of the MAC system. However, this system will interface at appropriate levels with standard DOD communications and automated systems.

6. (U) WORK PERFORMED BY: Air Force Systems Command's Electronics Systems Division (ESD) will provide overall program management. Contractors have not yet been identified.

7. (U) MAC Command and Control (C2) System (Single Project in Program Element).

A. (U) Project Description: MAC does not have the ability to rapidly and accurately exchange vital command and control information between ground C2 elements and the aircraft. In addition, there is minimal C2 information processing support available to CONUS MAC wings and none available to overseas units. This project will develop a data terminal primarily for airborne aircraft installation and a standard local distributed processing capability with each system being sized to the unit being supported. The local distributed processing network will be interoperable with the airborne data terminal and, at appropriate command levels, with DOD standard communication and automated systems.

B. (U) Program Accomplishments and Future Effects:

(1) (U) FY 1982 Accomplishments: N/A

(2) (U) FY 1983 Program: Develop data terminal and prepare a statement of work for a prototype local distributed processing network.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Prototype a local distributed processing network at a CONUS strategic airlift wing and another an an overseas tactical airlift wing. These prototype efforts will lead to the development of a detailed functional description for the standard follow-on system contracting effort.

(4) (U) Program to completion: Complete local distributed processing network development and perform contracting effort for system implementation.

C. (U) Major Milestones: N/A

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: N/A

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63431F　　Title: Advanced Space Communications
DOD Mission Area: 333 Strategic Communications　　Budget Activity: 5 Intelligence & Communications

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	63,301	39,949	39,924	45,672	Continuing	N/A
1227	Terminal Segment Technology	16,300	9,000	9,200	8,400		
2028	Space Segment Technology	32,200	20,200	20,900	29,100		
2029	Space Comm Systems Technology	14,700	10,749	9,824	8,172		

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This element is the only Air Force program for advanced development of satellite communications system concepts, techniques, and technologies. The program identifies, develops, demonstrates, evaluates, and transitions to operational systems the satellite and airborne terminal technology necessary to support global command, control and data relay communications. The requirement is to provide communications that survive in electronic jamming and nuclear blackout environments.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	66,151	52,349	53,934	-	Continuing	N/A
Procurement		Not Applicable				

FY 82: Reduction in scope of technology development.
FY 83: Congressional reduction in Lasercom program.
FY 84: LASERCOM experiment funding for FY 84 deferred to FY 86 by PDM.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)　　Not Applicable

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5. (U) RELATED ACTIVITIES: The technologies and concepts developed in this program will be transitioned to operational systems for implementation. These systems are represented by the Defense Satellite Communications System (PE 33110F), and MILSTAR (PE 33603F) which supports both the strategic and tactical/ mobile forces. Satellite communications system planning and technology development are coordinated within the Air Force among other communications development program elements, with the Defense Communications Agency/Military Satellite Communications Office and with Army and Navy companion efforts: Navy - Navy Satellite Communications, Project 0728, Extremely High Frequency Satellite Communications (PE 33109N); Army - Tactical Satellite Communications Systems (PE 33142A, Project C456). Exploratory developments under PE 62702F (Command, Control and Communications) transition to this element for advanced development. This program also works closely with NASA organizations involved in communications technology development such as the Lewis Research Center and the Goddard Spaceflight Center.

6. WORK PERFORMED BY: This program and Projects 2028 and 2029 are managed by Air Force Systems Command, Space Division, Los Angeles, CA. Project 1227 is managed by Rome Air Development Center, Griffiss AFB, NY. Facilities supporting these efforts include: the Air Force Wright Aeronautical Laboratories, Wright-Patterson AFB, OH, the Electronic Systems Division, Hanscom AFB, MA; the Air Force Geophysics Laboratory, Hanscom AFB, MA., and the Air Force Weapons Laboratory, Albuquerque, NM. Supporting commands include Air Force Communications Command, Scott AFB, IL, for operational planning; and Electronic Security Command, Kelly AFB, San Antonio, TX for postulating [ ] The Advanced Space Communication program involves approximately 50 current or planned separate contracts. Major contractors are: McDonnell Douglas Aircraft Corporation, St. Louis, MO, for the space laser communications program; TRW Systems Group, El Segundo CA, and Hughes Aircraft Company, Culver City, CA, for solid state amplifiers; Hughes Aircraft Company, Torrance, CA, for traveling wave tube amplifiers; Raytheon Corporation, Wayland, MA, for the SHF/EHF Airborne Terminal Solid State Amplifier, and Low Cost Antenna Pointing System; and Linkabit Corp, La Jolla, CA, for the Command Post Modem/Processor. Federal Contract Research Center support is provided by the Aerospace Corporation, Los Angeles, CA, the MITRE Corporation, Bedford MA; and Lincoln Laboratory; Bedford, MA.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

(U) Project: 1227 - Terminal Segment Technology

The Terminal Segment Technology project evaluates space communications system airborne terminal requirements (Army has the ground terminal development responsibilities for the Services), and develops concepts to meet these needs, evaluates the technology available to implement the concept, and determines what additional technology development is required; conducts simulation and concept evaluation efforts, and assists operational systems in planning for evolutionary improvements in capability. These efforts support development of an integrated set of Satellite communications capabilities for all defense requirements and insures that the technology development required to reduce risk is available prior to full scale development decisions.

Program Element: 63431F | Title: Advanced Space Communications
DOD Mission Area: 333 Strategic Communications | Budget Activity: 5 Intelligence & Communications

In FY82, the Small Super High Frequency/Extremely High Frequency Airborne Terminal and the Command Post/Modem Processor were tested aboard the Wright-Patterson AFB C-135 test aircraft. An upgrade development for this terminal which will allow future testing with the FLTSAT EHF Package (FEP) and MILSTAR Satellite Program was st[illegible]ed. Extremely high frequency (EHF) terminal subsystems developments for MILSTAR were initiated and are plann[illegible] r completion in FY83 and FY84. These include a low profile antenna, traveling wave tubes (TWT), a low nois[illegible] mplifier, a solid state amplifier, and a low cost antenna pointing system. Also planned for a FY84 start is an a[illegible]ed airborne terminal which will be designed using these new subsystems, and will be optimized for low life cycl[illegible]. The concept here is to build a generic advanced airborne terminal using the latest available technology ([illegible] d state amplifiers, low radar cross section antennas etc.) so an acquisition SPO will have post 1985 technolog[illegible] lable.

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: 2028 - Space Segment Technology

A. (U) Project Decription: The military services, the Commanders-in-Chief of the Unified and Specified Commands, and the National Command Authorities require global, secure, jam-resistant and survivable satellite communication throughout the spectrum of war, including Single Integrated Operations Plan execution and management, theater conflict management, crisis management, and contingency operations. Satellites provide significant advantages in terms of survivability and global coverage without dependence upon foreign based assets. This project develops configurations, subsystems and components for spacecraft to meet identified technology requirements of new or improved space communication systems. Development is initiated when a detailed system concept is prepared or when a new requirement is identified which exceeds the capabilities of available technologies. Configuration development includes design of the space segment to provide increased survivability, connectivity, reliability and capacity. Space technology to support interference and jamming protection is addressed. Subsystem development includes highly advanced communications capabilities involving extremely high frequency (EHF) and optical (Laser) technologies. Component development includes spacecraft communications amplifiers, both traveling wave tube and solid state at X-band and EHF with increased power; spacecraft antennas; communication processors; and other component technology to improve reliability, capacity, flexibility, and jam resistance.

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: Particular emphasis was on EHF and optical communications. Contracts were awarded for 7 GHz solid state device development to five domestic sources. 20 GHz solid state amplifier developments continued with the National Aeronautics and Space Administration (NASA).

Program Element: 63431F Title: Advanced Space Communications
DOD Mission Area: 333 Strategic Communications Budget Activity: 5 Intelligence & Communications

A 60 GHz solid state amplifier development was initiated with NASA Goddard Spaceflight Center. A dual award was made for a 20 GHZ active aperture antenna, which combines solid state amplifiers and a spacecraft antenna into a single subsystem. A contract was awarded to develop an EHF nulling antenna for use in a wideband receive subsystem. Work with the Naval Ocean Systems Center for signal processor technology and high gain antennas continued. The management of the Space TWT Recovery Program was taken over by Project 2028. Development of a LASERCOM test terminal for the [ ] aircraft was begun. Development of the LASERCOM Space Measurement Unit was continued.

(2) FY 1983 Program: Development efforts will concentrate on EHF technologies for satellite application such as solid state power amplifiers, null steering and time-hopped narrow beam antennas and onboard processor Development and testing of advanced development model hardware will continue. 20 GHz and 60 GHz solid state amplifier development contracts will be awarded. Reliability testing of solid state devices will be initiated. Contracts for the generic TWT and monitored production line effort will be awarded. The Lasercom Space Measurement Unit development will be terminated. The Lasercom [ ] test terminal development will continue.

(3) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: EHF satellite technology development will continue. The EHF Antenna Test Program will be initiated. The TWT recovery program will continue. The Lasercom [ ] test terminal development will continue toward testing now planned for 1987 in an air to air configuration.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

9. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project 2029 - Space Communication System Technology:

A. (U) Project Description: This project addresses the systems aspects of future Military Satellite Communications system solutions (new systems and upgrades to existing systems). Space segment and terminal segment requirements identified by this project are pursued in Project 1227 (Terminal Segment Technology) and Project 2028 (Space Segment Technology). The basis for the system analyses performed in this project is the architectural requiements identified by the Services working with the Defense Communications Agency/Military Satellite Communications System Office. A primary concentration is future military satellite communications system solutions for the Department of Defense's strategic and tactical combat forces. This project includes the integration of multiple technologies for ground based and orbital testing and evaluation.

Program Element: 63431F Title: Advanced Space Communications
DOD Mission Area: 333 Strategic Communications Budget Activity: 5 Intelligence & Communications

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: Advanced concepts for future military satellite communications (MILSATCOM) and space data relay were explored, with emphasis on the strategic and tactical forces. Key technologies were breadboarded and simulated to verify performance characteristics of EHF MILSATCOM systems. Work began on developing a Satellite Data Link Standard (SDLS) at EHF to allow interoperability of space systems at EHF. The EHF technology that this program developed is transitioning to an operational program with the formation of the MILSTAR program office and the production of an EHF package (to be built by Lincoln Laboratory) for FLTSAT. The project continued its support of satellite communications technology developed at Lincoln Laboratory; the Military Satellite Vulnerability Analysis Model (MVAM) and Red Team efforts[ ]; the Military Satellite Communications (MILSATCOM) requirements and architecture activities at the Electronic Systems Division (ESD); and general MILSATCOM systems engineering and planning activities. The MVAM software was transferred to an[ ]computer for system validation. Advanced Development models (ADMs) of[ ] in USAF operational exercises were designed and the hardware tested. Studies of atmospheric scintillation (AF Geophysics Laboratory), MILSTAR replenishment (in-house), frequency orbital congestion (Electromagnetic Compatibility Analysis Center), and Technology roadmap (in-house) continued.

(2) FY 1983 Program: Project 2029 will continue support of satellite communications technology development at Lincoln Laboratory, the Military Satellite Vulnerability Analysis Model (MVAM) and Red Team efforts[ ]and general SATCOM systems engineering and planning activities. Work on a Satellite Data Link Standard (SDLS) and its application to a space data link architecture will continue. The scope of the effort will encompass the total space communications and space data relay requirements of the Department of Defense. Performance measurements and assessment of integrated EHF technologies will continue. Work will start on a study to more accurately define atmospheric effects on EHF propagation. Orbital frequency congestion work for the 1985 Space World Administrative Radio Conference (WARC) started in FY82 will continue. Development of[ ] to serve as training tools during USAF exercises will continue.

(3) FY 1984 Planned Program: Based on the space communications and space data relay architectural and systems definition efforts of FY 1983, specific implementation objectives will be pursued to a next level of detailed design. These detailed design efforts will be transitioned to acquisition program elements or new program elements initiated. Performance measurement and assessments of integrated EHF technologies will continue. [ ] MILSATCOM general systems engineering and planning activities will continue. These cost estimates are based on prior experience with technology development activities, contractor estimates and government laboratory estimates.

(4) (U) This is a continuing program.

C. (U) Major Milestones: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64778F Title: NAVSTAR Global Positioning System
DOD Mission Area: #361 - Navigation and Position Fixing Budget Activity: #5 - Intelligence and Communications

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

PROJECT NUMBER	TITLE	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	165,377	122,651	95,714	55,689	44,531	1,071,476

2. (U) BRIEF DESCRIPTION OF PROGRAM ELEMENT AND MISSION NEED: This program element funds Air Force participation in the joint program for Phase II, full scale development, of the NAVSTAR Global Positioning System. It includes development of the GPS navigation satellites and the Air Force portion of GPS user avionics as well as development and deployment of the GPS ground control segment. Military forces need to know precise location to enhance command and control and to engage in strategic and tactical warfare. A global, common grid positioning and navigation system is required to increase both accuracy and the availability of current weapon systems, especially at night and in adverse weather, thus significantly increasing their effectiveness. GPS satellites will also carry the Integrated Operational NUDET Detection System (IONDS) as an additional payload to detect and locate nuclear detonations. The GPS Mission Element Need Statement was revalidated by the Secretary of Defense at Milestone II.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	TOTAL FOR PROGRAM ELEMENT	165,377	122,837	98,927		114,923	1,089,578

(U) Funding decrease of $186K in FY83 due to reprogramming actions. Funding variances of $3,213K FY84 and $2,701K FY85 due to changes in inflation indices. Decrease of $11,768K in the to completion estimate due to inflation and administrative adjustments.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

None. See descriptive Summaries for Program Elements 35164F and 35165F.

5. (U) RELATED ACTIVITIES: The joint program manager coordinates the supporting activities of the Army, Navy, Marine Corps, Defense Mapping Agency, Department of Transportation and North Atlantic Treaty Organization through his deputies in the Joint Program Office. The use of the Global Positioning System for providing guidance corrections for tactical missiles is being separately explored under Program Element 63601F, Conventional Weapons Technology. Investigation of advanced anti-jamming technology is conducted under Program Element 63203F, Advanced Avionics for Aircraft. Program Element 64778F also supports the Navy's Fleet Ballistic Missile Programs (Program Element 11221N Fleet Ballistic Missile Systems).

Program Element: #64778F Title: NAVSTAR Global Positioning System (GPS)
DOD Mission Area: #361 - Navigation and Position Fixing Budget Activity: #5 - Intelligence and Communications

(U) The North Atlantic Treaty Organization Global Positioning System Project, a cooperative venture between the United States and nine other nations, provides information to these nations to assist in making decisions about adopting the system for military forces.

(U) Full Scale Development of user equipment is funded by all services under Program Elements 64777N and 64778A/F NAVSTAR Global Positioning System for the Navy, Army and Air Force, respectively. The Air Force also funds satellite development and ground control segment development/deployment in this PE. Funds to procure the inital 28 satellites via a multiyear block buy, to procure follow-on replenishment satellites, and to develop preplanned product improvements to GPS are in PE35165F, NAVSTAR GPS Space and Control Segments. RDT&E and procurement funds to integrate GPS avionics into Air Force ground and airborne platforms is in PE 35164F NAVSTAR GPS User Equipment.

(U) The Integrated Operational Nuclear Detonation Detection System (IONDS) payload will be flown on all remaining first generation GPS satellites (NAVSTARs 8-11) and on all operational satellites. Program Elements 31357F and 12433F, Integrated Operational Nuclear Detonation Detection System, fund IONDS payloads. Expendable launch services (Atlas E/F) are funded under Program Element 35119F, Space Boosters. Space Shuttle launches are funded under Program Element 35171F, Space Launch Support.

6. (U) WORK PERFORMED BY: The Joint Program Office is located at the Air Force Systems Command's Space Division, El Segundo, CA. The satellite contractor is Rockwell International/Space Operations and Satellite Systems Division, Seal Beach, CA; International Telephone and Telegraph, Nutley, NJ, is the subcontractor for the navigation subsystem. Aerospace Corp., El Segundo, CA, provides technical and engineering support. There is a competitive User Equipment development, with Magnavox Advanced Products and Systems Co., Torrance, CA, and Rockwell International/Collins Government Avionics Div., Cedar Rapids, IA as the competitors. Intermetrics, Cambridge, MA, is the user equipment software independent verification/validation contractor. Operational Control Segment development/deployment is being done by International Business Machines/Federal Systems Div., Gaithersburg, MD. Logicon, Long Beach, CA, is the software independent verification/validation contractor.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: NAVSTAR Global Positioning System

A. (U) Project Description: (U) The NAVSTAR Global Positioning System (GPS) is a spaced-based 18 satellite radio positioning and navigation system designed to provide users with worldwide, all weather , three-dimensional position (16 meter SEP), velocity (.1 meter/sec) and precise time (within .1 microsecond). GPS provides a common navigation grid for land, air and sea units for coordinated operations. GPS dramatically improves our strategic target mapping capability, the probability of target acquisition, low-level ingress/egress, flexible routing, and the accuracy of delivered weapons. These features, along with a capability for highly accurate passive operations, enhance the force effectiveness and survivability of many US weapon systems.

Program Element: #64778F Title: NAVSTAR Global Positioning System (GPS)
DOD Mission Area: #361 - Navigation and Position Fixing Budget Activity: #5 - Intelligence and Communications

(U) GPS consists of three segments. The space segment produces the worldwide navigation signals. It consists of the 18 satellite constellation plus several on orbit spares. The control segment consists of five Monitor Stations and three Ground Antennas (located around the world) and a Master Control Station (MCS), which will be a tenant in the Consolidated Space Operations Center. The Monitor Stations measure satellite performance parameters which are evaluated and corrected by the MCS and then forwarded to the satellites by the Ground Antennas. The user segment consists of the equipment and interfaces necessary to receive and process GPS satellite signals into position, velocity, and time data for various military users.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The R&D satellite constellation was maintained to support the Navy's Fleet Ballistic Missile Programs and continued Global Positioning System user equipment testing. Fabrication of three replenishment satellites (NAVSTARs 9-11) continued with NAVSTAR 9 now ready for launch. The design of Block II satellite modifications to incorporate operational requirements and provide for shuttle launch was completed. Fabrication of the Block II qualification test vehicle began. The development and integration of mission control functions for the control segment continued with the software critical design review. User equipment development continued with both contractors finishing critical design reviews of the user sets and their interfaces with the test platforms.

(U) The Congressionally approved 28 satellite block buy was initiated with a long lead contract award in Sep 82 and fully implemented with a Firm Fixed Price production contract in early CY 83 within the funding profile provided to Congress.

(2) (U) FY 1983 Program: Replenishment satellites, NAVSTARs 10 and 11, will be tested and delivered ready for launch. Launch of two R&D replenishment satellites is expected in late FY 83. Fabrication of the Block II qualification test vehicle satellite will be completed. Control segment development will continue with activation of the initial operational Master Control Station at Vandenberg AFB CA. User equipment development will continue with integration of preproduction user equipment from both competitors into Phase II host vehicles. Development testing of user equipment began in preparation for initial operational test and evaluation and a subsequent production decision.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: (U) Continues operation of the five-satellite developmental GPS constellation to support initial operational testing of user equipment and the Navy's Fleet Ballistic Missile Programs. Launch of the last R&D satellite is planned.

(U) Completes testing of the production GPS satellite. Continues full scale development of the GPS operational ground control segment. Includes installation of overseas Monitor Stations and Ground Antennas.

(U) Funds completion of the Air Force portion of the user equipment development and initial operational test and evaluation in two Air Force platforms. A production DSARC is planned for May 1984.

(U) Cost estimates are based on negotiated costs (for space, control, and user segment RDT&E) or extrapolations of existing costs to continue support of the R&D satellite constellation, control segment, and launch services. A DoD level review of the GPS cost estimate was last completed in November 1982.

(4) (U) Program to Completion: (U) Support for the R&D constellation will continue on a decreasing basis ending in FY 1988 when the operational GPS constellation is completed. Control segment development, deployment, and support will continue until FY 1987 when turnover to SAC is planned. User segment initial operational testing will be complete in FY 1985 with R&D required to integrate GPS avionics into follow-on Air Force aircraft funded in PE 35164F. The development of the baseline GPS system will be complete in FY 1988.

C. (U) Major Milestones:

Milestones	
Defense Systems Acquisition Review Council II	2 Q CY 79
Begin Satellite Production	3 Q CY 82
Begin User Avionics IOT&E	3 Q CY 83
Defense Systems Acquisition Review Council III	2 Q CY 84
Begin User Avionics Production	3 Q CY 84
Shuttle Launch First Satellite	4 Q CY 85
Achieve Worldwide 2-D Capability	2 Q CY 87
Achieve Worldwide 3-D Capability	4 Q CY 88

3-D Satellite capability slipped one quarter due to time required to reprogram procurement funds and intitiate production.

Budget Activity: Intelligence and Communications, #5
Program Element: #64778F, Navstar Global Positioning System GPS

Test and Evaluation Data

1. (U) Development Test and Evaluation(DT&E): This Program Element covers the development of the Navstar Global Positioning System. Phase I testing validated the system concept, identified preferred design parameters and demonstrated military utility. In the space segment, six of the eleven satellites procured from the Rockwell Space Division for the Validation Phase (Phase I) have been launched. Navstar seven, was launched in January 1982 but failed to achieve orbit due to a Atlas booster failure. The next launch, to support user equipment DT&E and the Navy's Fleet Ballistic Missile Improved Accuracy Program, is schedule for Summer 1983.

Five of six satellites are supporting user equipment testing. Because all of the clocks on Navstar 2 have failed, it is only being used for on orbit subsystem testing to provide design verification data. User equipment testing with GPS providing 3-dimensional position and velocity data (four satellite coverage) began in January 1979. Testing with all platforms (C-141, P-3B, F-4J, UH-1H and Army Truck) prior to the Defense System Acquisition Review Council Milestone II in June 1979 demonstrated navigation and positioning accuracies within ten meters 50% of the time. A GPS Phase I receiver has been integrated with an inertial measurement unit on a F-4J aircraft. With this system using only toss bombing techniques, 16 bombs were "dropped" on 3-6 Aug 1981. Bomb impacts were within [redacted] meters of the aim point 50% of the time. In addition, successful terrain following tests were flown with a UH-1H helicopter equipped with a GPS receiver. The GPS equipped helicopter flew thru 3-dimensional stored way points (latitude, longitude, altitude). These way points were computed by adding a preselected clearance to points from a terrain contour map. Manpack receivers were successfully installed and used aboard two Navy vessels during the five-nation RIMPAC '82 naval exercises in April 1982. F-4 flight tests in May at Yuma Proving Grounds were successful. Data was collected on Multiple Ejection Racks (MER) to support a decision on the type of rack, i.e., the Triple Ejection Rack (TER)--previously tested--or the MER, to be used for the A-6E Phase II testing. A Z-set receiver was successfully installed and used aboard the US Coast Guard ship VENTUROUS in May 1982 during a LORAN-C calibration mission along the Pacific Northwest coast. Convair 880 aircraft testing began in 1982 at Yuma to effect range verification and to investigate the use of a Navstar GPS Inertial Navigation System package on board the aircraft as a self-contained range instrumentation system.

(U) User equipment testing and demonstrations with Phase I sets have also been done under a ten nation North Atlantic Treaty Organization Memorandum of Understanding as well as the program DT&E. A "low cost" set has navigated successfully over the North Pole in a United Kingdom aircraft. A GPS set was also successfully tested on a French maritime patrol aircraft in the fall of 1981.

DECLASSIFY ON 30 Oct 1999
OR REVIEW ON 30 Oct 1985

Budget Activity: Intelligence and Communications, #5
Program Element: #64778F, Navstar Global Positioning System GPS

(U) DT&E of the space and ground control segments will be limited to refining further the effects of seasonal variations on satellite ephemeris predictions and determining the long term reliability of the space segment.

2. Operational Test and Evaluation (OT&E).

(U) During the GPS Validation Phase (phase I) completed in May 1979, tests were conducted by the Space Division (SD) to demonstrate some of the system's military applications, such as coordinate bombing, passive rendezvous, special anti-jam performance, approach to landing, Army land operations, and coordinated sea operations. Four satellites were used in the final phase I testing stages. Testing was conducted at Yuma Proving Ground, AZ, and San Clemente Island Test Area, CA. The Air Force Test and Evaluation Center (AFTEC) monitored selected portions of the phase I user equipment testing and provided an independent assessment for use in the Milestone II program review. No operational deficiencies were noted by AFTEC that would preclude transitioning to the full-scale engineering development (FSED) phase. Phase I contractors were Magnavox, Texas Instruments, Rockwell International Cedar Rapids Division, Rockwell International Satellite Systems Division, and General Dynamics Electronics Division.

(U) AFTEC performed an independent operational utility evaluation (OUE) of the projected operational space segment and published a report in March 1982. The report and accompanying briefing supported a space segment program review on 19 March 1982. The OUE focused on seven operational effectiveness objectives and one operational suitability objective. Evaluations were based entirely on development test and evaluation (DT&E) data. When necessary, DT&E data were supplemented with design information. Extensive modeling and analysis techniques were used throughout the OUE. Areas evaluated were the operational constellation, survivability, availability, navigation accuracy, command and control requirements, constellation replenishment, secondary payload impacts, and reliability. Overall operational effectiveness and suitability were projected to be satisfactory, and AFTEC supported program continuation.

(U) In the FSED Phase (phase II) of the program, AFTEC will be the executive test agency for all GPS operational test and evaluation (OT&E). Multiservice OT&E will be conducted on user equipment and the control segement, while the space segment testing will be primarily an Air Force effort.

(1)(U) The user equipment OT&E is scheduled from mid-April 1983 through September 1984. Defense Systems Acquisition Review Council (DSARC) III is scheduled for May 1984. The Army, Navy, Marine Corps, and North Atlantic Treaty Organization (NATO) will participate in the operational testing of the user equipment in a broad range of military applications. User equipment testing will include several months of combined DT&E/OT&E followed by a period of dedicated OT&E for each test vehicle. This testing is intended to provide the independent OT&E input for a user equipment production decision. Primary test vehicles will be: B-52G (with offensive avionics system), F-16, A-6 aircraft, aircraft carrier, attack submarine, army tank, UH-60 helicopter, and a manpack. Operator and maintenance personnel will be drawn from operational units. Primary test locations will be Yuma Proving Ground, AZ; Nellis AFB, Ft Campbell KY; and the San Clemente Island Test Area, CA. Phase II user equipment contractors are Magnavox and Rockwell International Cedar Rapids Division.

Budget Activity: Intelligence and Communications, #5
Program Element: #64778F, Navstar Global Positioning System GPS

(2)(U) Control segment OT&E will begin in April 1985 and extend to approximately January 1987. A period of combined DT&E/OT&E followed by a dedicated 90-day OT&E is planned. Qualified satellite command and control operators and maintainers from the Strategic Air Command (SAC), the control segment operating command, will perform the 90-day IOT&E. Sole control segment contractor is International Business Machines. The control segment will be colocated with the Consolidated Space Operations Center (CSOC) in Colorado Springs, CO.

(3)(U) Future space segment testing consists of a operational assessment using DT&E generated data obtained by monitoring operational satellite testing and launch, starting in FY 85. Additional IOT&E data will be gathered in conjunction with control segment testing, and a final report written to suport SAC assumption of operational command of the system. Sole space segment contractor is Rockwell International.

(U) Overall Navstar GPS OT&E objectives are to:

(1)(U) Evaluate GPS performance in a spectrum of missions in representative vehicles for Army, Navy, Air Force Marine Corps application. These include air, land, and water navigation; ordinance delivery; rendezvous; and landing approaches in both passive and hostile environments.

(2)(U) Evaluate GPS performance when operated and maintained by Air Force, Army, Navy, and Marine Corps operational and maintenance personnel.

(3)(U) Identify and track deficiencies and improvements.

Budget Activity: Intelligence and Communications, #5
Program Element: #64778F, Navstar Global Positioning System GPS

3. System Characteristics:

Characteristic	Objective	Demonstrated
Three-dimensional Position Accuracy	16 meters (50% of the time)	11.1 meters (Note 1)
Three-dimensional Velocity Accuracy	0.1 meters/second	0.12 meters/second
Time Transfer	10×10^{-9} second	25×10^{-9} second (Note 2)
Active Satellites on Orbit	18	5
Satellite Coverage	24 hours/day world-wide	4 hours/day over test area
Clock Stability	2×10^{-13}	1.3×10^{-13}
Satellite Mean Mission Duration	6 years	4 years (Note 3)
Anti-Jam Margin (Unaided Set) (Inertial Aiding Plus Adaptive Antenna)	[ ]	[ ]

NOTES:

1. (U) Accuracy is within 11.1 meters 50% of the time and 22 meters 90% of the time with test constellation spacing the same as a 24-satellite constellation. The 16 meter objective (18 satellites) corresponds to 10 meters (24 satellites).

2. (U) The standard deviation of the synchronization error is 25 nanoseconds.

3. (U) Phase I spacecraft have a design mean mission duration of 4.6 years. The spacecraft in orbit are supporting testing in spite of several clock failures. Fixes implemented on Navstars 3-6 and installed on the remaining spacecraft are expected to permit achieving the 4.6 year mean mission duration.

(U) Analyses of GPS characteristics are contained in the following test reports:

(1) Assessment of Navstar Global Positioning System Phase I Test Results (U), May 1979 (Confidential Document).

(2) Operational Utility Evaluation of the Navstar Global Positioning System Space Segment, Final Report (U), March 1982 (Secret Document).

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #33110F
DOD Mission Area: #323 - Common User Communications

Title: Defense Satellite Communications System (DSCS)
Budget Activity: #5 - Intelligence and Communications

1. (U) RESOURCES (PROJECT LISTING): ($ in Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	60,875	51,626	41,036	31,978	17,048	371,377

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Defense Satellite Communications System (DSCS) provides super high frequency satellite communications for secure voice and high data rate transmissions. It satisfies the unique and vital national security communications requirements of worldwide military command and control, crisis management, relay of intelligence and early warning data, treaty monitoring and surveillance information, and diplomatic traffic. Specifically, the DSCS supports the National Command Authorities, the Worldwide Military Command and Control System, the Defense Communications System, the Diplomatic Telecommunications Service, the White House Communications Agency and mobile forces of all Services. The DSCS satellite constellation is required through the 1990s.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in Thousands)

RDT&E	40,149	53,126	25,815	Continuing	Not Applicable
Missile Procurement	129,614	192,900	89,900	Continuing	Not Applicable
Other Procurement	2,205	2,649	3,058	Continuing	Not Applicable

RDT&E Changes

FY 82 - Reprogrammed $20.7M for DSCS III storage, continued development of solid state amplifiers, and integration of a DSCS II/DSCS III satellite pair on Titan III(34D)/Transtage and integration of DSCS III production satellite pairs on the Space Shuttle.

FY 84 - Additional $15.2M to continue development of planned product improvements for the DSCS III production satellites and to continue first-time integration of the production satellites on the Space Shuttle.

Missile Procurement Changes

FY 83 - Congressional Authorization reduced the program request by $10M

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Program Element: #33110F
DOD Mission Area: #323 - Common User Communications

Title: Defense Satellite Communications System (DSCS)
Budget Activity: #5 - Intelligence and Communications

FY 84 - Additional $30.0M to integrate the refurbished qualification satellite on the Space Shuttle/Inertial Upper Stage for a paired launch with a DSCS III production satellite, rather than the previously planned single satellite launch on a Titan III (34D)/Inertial Upper Stage. Change was made to optimize the use of launch vehicle assets. This funding also incorporates selected planned product improvements on the refurbished qualification satellite.

4. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Missile Procurement: Funds	129,650	181,600	117,004	398,054	468,335	1,421,081
Quantities	2	2	0	4	3	12
Other Procurement, Funds	2,220	2,649	0	0	0	Not Applicable
Military Construction, Funds	4,260	6,750	0	0	0	Not Applicable
Operations and Maintenance, Funds	6,820	13,940	7,429	8,681	Continuing	Not Applicable
Military Personnel, Funds	5,414	0	0	0	0	Not Applicable

5. (U) RELATED ACTIVITIES: The Defense Communications Agency is responsible for overall Defense Satellite Communications System program management, system engineering, and satellite operational direction. The military departments are responsible for individual elements of the system. The Army budgets, develops, and procures ground terminals under Program Element 33142A, Defense Satellite Communications System. The Navy performs these functions for shipborne terminals under Program Element 33109N, Satellite Communications System. In addition to its responsibility for the space segment, the Air Force develops and integrates airborne terminals under Program Element 11312F, Post Attack Command and Control System, and Program Element 32015F, National Emergency Airborne Command Post. The Air Force also provides launch services for the Titan III launch vehicle under Program Element 35119F, Space Boosters. The Inertial

Program Element: #33110F
DOD Mission Area: #323 - Common User Communications

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Upper Stage, to be used for launch with the Titan III(34)D and Space Shuttle, is being developed by the Air Force under Program Element 63411F. Inertial Upper Stage procurement, Inertial Upper Stage recurring integration , and Space Shuttle launch support will be furnished under Program Element 35171F, Space Launch Support. The Advanced Space Communications Program, Program Element 63431F, evaluates, develops, and demonstrates evolutionary communication satellite technologies for future communications satellite programs. The Air Force also has funding for ground equipment construction, operations and maintenance, and manpower to support its portion of the ground segment in PE 33605F, Satellite Ground Terminals.

6. (U) WORK PERFORMED BY: The Air Force Space Division, Los Angeles, CA, is responsible for the space segment of the Defense Satellite Communications System. TRW, Redondo Beach, CA, is the prime contractor for the design, fabrication, test and integration of Defense Satellite Communications System Phase II satellites. The Martin-Marietta Corporation, Denver, CO, is the prime contractor for the Titan III launch vehicle. General Electric Company, Valley Forge, PA, is the full scale engineering development and production contractor for the DSCS III spacecraft. Boeing Aerospace Division, Seattle, WA, is developing the Inertial Upper Stage. The Aerospace Corporation, El Segundo, CA, provides general systems engineering/technical direction to the Air Force Space Division System Program Office.

7. (U) PROJECTS LESS THAN THAN $10M IN FY 84: Not applicable

8. (U) DEFENSE SATELLITE COMMUNICATIONS SYSTEM (SINGLE PROJECT OVER 10 MILLION IN FY 1984):

A. (U) Project Description: See paragraph 2

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The first DSCS III development satellite remained in storage pending a planned launch in October 1982. Integration and testing of the second full scale development model satellite and refurbishment of the DSCS III qualification satellite were continued. A contract was awarded for initial production of two DSCS III satellites. Development was continued to implement the following approved planned product improvements on the production satellites: anti-jam command capability; improved communications security equipment; adjustable beacon; and solid state amplifiers to replace the Traveling Wave Tubes. Integration of DSCS II/DSCS III satellite pairs on both the Titan III(34D)/Inertial Upper Stage and Titan III(34D)/Transtage were continued. Integration of DSCS III production satellite pairs on the Space Shuttle was also continued.

(2) (U) FY 1983 Program: The first DSCS III satellite was launched on 30 October 1982, along with a DSCS II satellite, on a Titan III(34D)/Inertial Upper Stage launch vehicle. The DSCS III satellite will undergo four to five months of test and evaluation. The major DSCS III full scale development will be completed and the second demonstration flight satellite will become available for launch paired with the last DSCS II satellite. First time integration of this satellite, paired with a DSCS II, on the Titan III(34D)/Transtage will be completed. The qualification satellite refurbishment and launch vehicle integration will continue. First time integration of the production satellites on the Space Shuttle will also continue. Development of planned product improvements for the production satellites will continue. The last of the approved planned product improvements, enhancement of the Jammer Locator Electronics, will begin development. Procurement of the third and fourth production satellites will also begin.

Program Element: #33110F | Title: Defense Satellite Communications System (DSCS)
DOD Mission Area: #323 - Common User Communications | Budget Activity: #5 - Intelligence and Communications

(3) (U) FY 1984 Planned Program and Basis for FY 1984 Budget Request: Development will continue on the planned product improvements for the production satellites. Integration of the refurbished qualification satellite on the Space Shuttle/Inertial Upper Stage will continue. Incorporation of the planned product improvements on the refurbished qualification satellite will be initiated. Integration of the production satellites on the Space Shuttle will continue. Advance procurement will be initiated for four sets of long lead parts for satellites to be procured in FY 85 to sustain the DSCS III constellation in the late 1980s.

(4) (U) Program to Completion: Production of the four DSCS III satellites already on contract will continue. Integration of paired DSCS III satellites on the Space Shuttle will be completed in 1985. Seven additional production satellites will be acquired in FY 1985 (four) and FY 1986 (three). The first two production satellites will be delivered in mid-1985. The last production satellites in the approved program will be delivered in 1991. This approved production program will sustain the DSCS constellation into the early to mid 1990s. The Air Force, in conjunction with the Defense Communications Agency, will continue to investigate system improvements in performance, reliability, and survivability.

C. Major Milestones:

Milestones

Defense Satellite Communications System II		DATE	
Initial Contract Award (F1 - F6)		Mar 1969	
Initial Satellite Launch (F1 - F2)		Nov 1971	
Contract for replenishment satellites (F7 - F12)		Oct 1974	
Contract for additional satellites (F13 - F16)		Jul 1976	
Last Launch (F16 with DSCS III-A1)		Oct 1982	
Remaining launch (E15 with DSCS III-A2)		[ ]	

Defense Satellite Communications System III		DATE	
Defense Systems Acquisition Review Council I		Dec 1974	
Award Phase I (Preliminary Design) Contracts		Dec 1975	
Preliminary Design Review		Oct 1976	
Defense Systems Acquisition Review Council II		Dec 1976	
Award Phase 2 (Engineering Development) Contract		Feb 1977	
Defense Systems Acquisition Review Council III Production Decision		Dec 1981	
Launch First Demonstration Flight Satellite	*(Sep 1981)	Oct 1982	1/
Launch Second Demonstration Flight Satellite		[	]
First production satellite launches on Shuttle		[	]
Refurbished qualification satellite launch availability	*(Jul 1984)	Jun 1986	2/

*Date presented in FY 1982 Descriptive Summary

Program Element: #33110F
DOD Mission Area: #323 - Common User Communications

Title: Defense Satellite Communications System (DSCS)
Budget Activity: #5 - Intelligence and Communications

(U) Explanation of Milestone Changes

1/ Launch delayed by one month due to availability schedule for the Inertial Upper Stage.

2/ To optimize launch vehicle utilization, the refurbished DSCS III qualifiction satellite will not be launched as a single payload on a Titan III (34D)/Inertial Upper Stage, but will be paired with a DSCS III production satellite for a later launch on the Space Shuttle/Inertial Upper Stage. Modifications to achieve this compatibility with the Shuttle cause the indicated schedule change for the satellite's availability

Budget Activity: Intelligence and Communications, #5
Program Element: #33110F, Defense Satellite Communications System

Test and Evaluation Data

1. (U) Development Test and Evaluation: Development Test and Evaluation for the Defense Satellite Communications System II Space Segment is complete. For the Defense Satellite Communications System III, development test and evaluation was separated into two distinct phases. During Phase One, which extended from Defense Systems Acquisition Review Council I in December 1974 to Defense Systems Acquisition Review Council II in December 1976, development tests were conducted to demonstrate technical feasibility.

(U) The objective of Phase Two Development Test and Evaluation has been to verify the design and attain the highest confidence in Defense Satellite Communications System III Demonstration Flight Satellite performance. Phase Two testing is divided into three parts: in-plant, launch base, and on-orbit. The in-plant test program provides the performance baseline for production and consists of a combination of: developmental testing using thermal, structural, and development models; piece part, component and subsystem qualification testing; and extensive, systematic system level qualification model satellite tests to confirm total design integrity in a realistic, simulated orbital environment. Acceptance testing of the Defense Satellite Communications System III Demonstration Flight Satellite has verified manufacturability and performance against the design baseline. This testing was planned to be incremental and establish performance confidence as satellite integration proceeded. During launch base testing, each Demonstration Flight Satellite will be tested to verify its launch readiness. After launch, on-orbit testing will consist of three distinct sequential elements: (1) immediate post-injection evaluation of the performance of satellite support subsystems conducted by the Air Force Space Division via the Air Force Satellite Control Facility; (2) verification of communications subsystem and Super High Frequency tracking, telemetry, and command performance via the Camp Parks, CA radiometric test terminal; and (3) evaluation of interoperability with varied Defense Satellite Communications System and non-Defense Satellite Communications System earth terminals and compatibility with the Satellite Configuration Control Element. The third test element will be managed by the Defense Communications Agency Defense Satellite Communications System Program Manager.

(U) System level qualification satellite testing started in June 1980 and continued through May 1981. The Qualification Test Satellite was subjected to electromagnetic compatibility tests, acoustic, pyro shock, thermal balance, and thermal vacuum environmental tests. The qualification satellite completed system level integration, radio frequency compatibility electrical system baseline tests and thermal vacuum tests. The results of completed tests indicate that demonstrated performance meets specification requirements.

Budget Activity: Intelligence and Communications, #5
Program Element: #33110F, Defense Satellite Communications System

(U) All subsystems for the first Defense Satellite Communications System III Demonstration Flight Satellite completed acceptance tests and were integrated in the satellite. System level acceptance testing started in July 1980 and continued through March 1981. This satellite (and the second Demonstration Flight Satellite) were subjected to a similar sequential series of tests as the qualification satellite. The first Demonstration Flight Satellite completed system level integration, radio frequency compatibility, electrical system baseline tests, acoustic and thermal vacuum tests. Again, the results of completed tests indicate demonstrated performance meets specification requirements. All components and subsystems passed; no major waivers were required and no major design problems were uncovered. The first demonstration flight spacecraft passed acceptance tests in June 1981. Assembly and test of the second flight demonstration satellite is in progress and on schedule. The first DSCS III spacecraft, paired with a DSCS II, was launched on 30 Oct 82. The on-orbit portion of Development Test and Evaluation is in progress. Initial Operational Test and Evaluation (IOT&E) will begin in January 1983.

2. (U) Operational Test and Evaluation: The Defense Communications Agency (DCA) manages the overall DSCS program, which includes the space and terminal segments. The Air Force System Command's Space Division (SD) is responsible for the acquisition, deployment testing, and operational support of the space segment. The US Army is the executive agent for all ground terminal procurement, installation, and testing.

a. (U) Currently the Army is procuring three different ground terminals to be used in the DSCS system. When the terminals are delivered to the Air Force, the Air Force Communications Command (AFCC) conducts an operational test and evaluation of the terminals using Air Force personnel to operate and maintain the terminals in an operational environment.

(1) (U) The AN/TSC-100 is a small, transportable terminal for use by the ground mobile forces (GMF). AFCC conducted the AN/TSC-100 qualification operational test and evaluation from May 1982 through July 1982. at Tinker AFB, OK. The major problems with the terminal were inadequate technical orders and a lack of trained personnel. These difficulties will have to be fixed before the terminals can be considered truly operational.

(2) (U) The AN/GSC-39 (medium terminal) will employ the electronics of an older operational terminal, the AN/FSC-78, but will have a smaller antenna. The AN/GSC-39 and the AN/GSC-49 terminals are a major part of the Jam Resistant Secure Communications (JRSC) program. AFCC will conduct the JRSC IOT&E from March 1983 through September 1983.

b. (U) DSCS III consists of the space segment and its satellite configuration control element (SCCE). For the space segment, SD is responsible for the overall test and evaluation. OTEA will conduct, with triservice participation, a combined DT&E/IOT&E (AFTEC will manage the Air Force IOT&E participation) to minimize test duplication. The IOT&E will begin in January 1983 (approximately 60 days following the 30 October launch) and will

Budget Activity: Intelligence and Communications, #5
Program Element: #33110F, Defense Satellite Communications System

last for about 60 days. The objectives will be to independently evaluate DSCS III performance and operational effectiveness, to assess the antijam capabilities of the satellite and the SCCE (and the interface of these items with current operational DSCS terminals), and to evaluate the SCCE logistics supportability, reliability, availability, and maintainability. The first SCCE will be installed at Sunnyvale AFS, CA, and will be operated by personnel from Detachment 3, 1901st Communications Squadron. Seven more SCCEs are planned. The SCCE will be contractor-maintained (General Electric) and supported. The first satellite will be a demonstration flight satellite and the SCCE will be an engineering development model, both of which will be quite similar to planned production items.

3. System Characteristics:

Technical Characteristics	Objective	Current Estimate	D/ Demonstrated
Frequency (Gigahertz)	7.25-8.4	7.25-8.4	7.25-8.4
Bandwidth (Megahertz per channel)	50-85	50-85	50-85
Effective Isotropic Radiated Power (decibels)			
a. Channels 1 & 2 (EC/Spot/AC(Dish)) A/	29/40/44	29/40/44	29/40/44
b. Channel 3 (EC/EC/Spot)	25/23/34	25/24/34	25/25/34
c. Channel 4 (EC/EC/Spot/AC(Dish))	24/23/34/38	25/24/35/38	25/24/35/38
d. Channels 5 & 6 (EC)	25	25	25
e. Beacons (EC)	12	12	12
Signal Gain to System Noise Temperature Ratio E/			
a. Earth Coverage Horn	-15	-13	-13
b. Earth Coverage MBA B/	-16	-15	-15
c. Spot MBA	-1	-0.5	-0.5
Nulling (decibels below EC reference) Receive MBA C/	[		]

A/ EC - Earth Coverage; Spot - 1.0° minimum diameter; AC - Area Coverage; Dish - 3.5° beam diameter switchable on orbit to desired channel.
B/ MBA - Multiple Beam Antenna.
C/ Based on a single null anywhere in the satellite field of view created within a MBA earth coverage pattern.
D/ Demonstrated performance based on the results of system level qualification satellite testing.
E/ Decibels per Degree Kelvin.

Budget Activity: Intelligence and Communications, #5
Program Element: #33110F, Defense Satellite Communications System

(U) Operational Characteristics	Objective	Current Estimate	Demonstrated
1. (U) Quantities (per satellite)			
a. 40 Watt TWTAs A/ (Channels 1 and 2)	2	2	2
b. 10 Watt TWTAs (Channels 3 thru 6)	4	4	4
c. SHF Command Links	2	2	2
d. Protected Beacons	2	2	2
2. (U) Satellite Reliability B/	0.7	0.7	0.75*
3. (U) Launch Vehicle (types) C/	Titan IIIC Titan 34D/IUS STS/IUS	Titan 34D/IUS Titan 34D/Transtg STS/IUS	-
4. (U) Weight (lbs) D/	1650	1866	1866

A/ TWTA - Traveling Wave Tube Amplifier
B/ Probability of survival at 7 years
C/ IUS - Inertial Upper Stage: STS - Space Transportation System (Space Shuttle)
D/ On-orbit satellite weight less expendables (dry weight)

* Based on analysis of demonstrated piece part reliabilities.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 33126F
DOD Mission Area: #363, Common User Communications

Title: Long Haul Communications - DCS
Budget Activity: #5, Intelligence and Communications

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	TITLE	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL PROGRAM ELEMENT	7,940	12,737	6,303	11,542	Continuing	N/A
2022	Automated Digital Communications Processing	2,780	2,500	1,167	2,711	Continuing	N/A
2155	Systems Control	2,480	2,690	2,046	3,235	Continuing	N/A
2157	Transmission Improvements	2,380	2,600	1,465	3,115	Continuing	N/A
2206	Digital European Backbone	200	200	195	191	Continuing	N/A
2440	Secure Voice Improvements Program	100	216	292	2,290	Continuing	N/A
2953	Movements Information Network	0	1,031	1,138	0	0	2,169
2981	Defense Data Network	0	3,500	0	0	0	3,500

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This element is the United States Air Force portion of the tri-Service RDT&E program for the Defense Communications System (DCS). The DCS provides the long haul, point-to-point, and switched network telecommunications needed to satisfy requirements of the National Command Authorities, the Department of Defense and certain other Government agencies. The DCS RDT&E program is structured to define system and subsystem architecture, specify design parameters, and develop telecommunications technology for DCS modernization and improvement. Work in this element provides the equipment for an orderly transition to a unified second generation DCS and determines the architecture for the third generation DCS. It includes technology development and subsystem implementation in the areas of automated digital communications processing and distribution techniques, performance assessment and network management improvements, and transmission improvements.

3 (U) COMPARISON WITH FY83 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	7,970	9,537	10,337	Continuing	N/A
Procurement, Other	14,423	9,249	27,603	Continuing	N/A
Military Construction	630	970	2,182	0	3,782

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #33126F
DOD Mission Area: #363, Common User Communications

Title: Long Haul Communications - DCS
Budget Activity: #5, Intelligence and Communications

3. (U) COMPARISON WITH FY 1983 DESRIPTIVE SUMMARY (Continued): ($ in thousands)

RDT&E:

FY 1982: Minor reductions in scope of effort in Projects 2022, 2155 and 2157.

FY 1983: Addition of funds to support Defense Communications Agency development of the Defense Data Network.

FY 1984: Level of effort reduced and work deferred in Projects 2022, 2155 and 2157 to fund higher priority programs. Application of lower inflation rates.

Procurement, Other:

FY 1982: Project 2206 (DEB) repricing based on better data.

FY 1983: Project 2206 (DEB) repricing based on better data. Project 2157 is a purely RDT&E technology base project; therefore, procurement not related to the RDT&E tasks of this project are now included under wideband system upgrade efforts within this program element.

FY 1984: Project 2206 (DEB) repricing based on better data. Procurement not related to Project 2157 no longer included.

Military Construction:

FY 1983: Project 2206 (DEB) repricing based on better data.

FY 1984: Project 2206 (DEB). Delays in engineering planning and site preparation will cause construction of the Woenstrecht (Netherlands) digital tropospheric scatter facility to slip to FY 1985. Repricing from earlier estimate based on better data.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY1982 Actual	FY1983 Estimate	FY1984 Estimate	FY1985 Estimate	Additional to Completion	Total Estimated Cost
Procurement, Other						
Project 2157 (Transmission Improvements)	5,580	0	0	0	Continuing	N/A
Project 2206 (Digital European Backbone)	8,054	8,002	17,193	17,137	Continuing	N/A
Project 2440 (Secure Voice Improvement Program)	0	0	0	21,354	Continuing	N/A
Military Construction						
Project 2206 (Digital European Backbone)	630	990	0	3,000	4,620	3,782

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #33126F
DoD Mission Area: #363, Common User Communications
Title: Long Haul Communications - DCS
Budget Activity: #5, Intelligence and Communications

5. (U) RELATED ACTIVITIES: The DEB project (2206) involves tri-Service funding. It involves installation of equipment at Army, Navy, and Air Force sites. Overall program management for this project is exercised by the Defense Communications Agency (DCA) through appropriate Management Engineering Plans. The remaining four projects (2022, 2155, 2157, and 2440), are part of the coordinated DCS RDT&E program as directed by the DCA Five Year Program. Each Service programs funds to support work directed by the DCA Plan. Acquisition of communications security (COMSEC) equipment through the National Security Agency to support Project 2440 is funded under Program Element 33401F.

6. (U) WORK PERFORMED BY: Air Force Systems Command manages this program element through the Electronics System Division (ESD), Hanscom Air Force Base, MA, (Projects 2206, 2440 and the acquisition aspects of 2157) and the Rome Air Development Center, Rome, NY, (Projects 2022, 2155 and 2157). Electronics System Division receives technical support the MITRE Corporation, Bedford, MA. Other major contractors are: Computer Sciences Corporation, Falls Church, VA; Softech, Waltham, MA; Honeywell, Tampa, FL; RCA, Camden, NJ; and, Signatron Inc, Lexington, MA. Other contractors (total value, $3.9 Million) are: Digital Communications Corporation, Germantown, MD, (Project 2157); Western Union, McLean, VA, (Project 2022); Ford Aerospace and Communications Corporation, Boulder, CO, (Project 2022); Harris Corporation, Melbourne, FL, (Project 2157); Hazeltine, Greenlawn, NY, (Project 2157); and, Raytheon, Sudbury, MA, (Project 2157).

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project 2022 Automated Digital Communications Processing. As the (DCS) transitions to an all digital system, capabilities are required to provide service which meets customer needs. These capabilities will be designed and tested under this project. First, is a gateway element which will provide the interface between the DCS and other digital networks. The ability to connect the DCS to other digital networks will provide significant cost savings and more timely information exchange between Defense and non-Defense customers. Second is a feasibility demonstration of features such as automated distribution (electronic mail), digital facsimile, and word processing. The purpose of the latter is to assess potential cost savings and manpower reductions accruing from their use. During FY1982 a packet switching gateway was completed and integrated switched network experiments were begun. The switched network traffic simulator will be completed in FY1983 and complete development of a multi-net gateway is scheduled for FY1984.

B. (U) Project 2155 System Control. The purpose of this project is to develop system control techniques, algorithms, hardware and software specifications which provide worldwide automated traffic reroute and restoral. Basic data on traffic loading will come from DCS switches. System control equipment will improve DCS traffic management effectiveness by more than thirty percent. The major effort includes the Automatic Voice Network (AUTOVON) Network Control System (ANCS). The first ANCS sites are being installed in Europe for field testing. System control techniques for tactical/strategic communications system interfaces will occur in FY1983. Testing of a prototype digital analysis and patching system will continue in FY1983, leading to acquisition specifications in FY1984.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #33126F
DoD Mission Area: #363, Common User Communications

Title: Long Haul Communications - DCS
Budget Activity: #5, Intelligence and Communications

C. (U) Project 2157 Transmission Improvements. The objective of this project is to improve transmission survivability, efficiency, capacity and reliability of Air Force and Defense Communications System communication links by applying new techniques such as millimeter wave and fiber optics, and by developing transmission equipment embodying new techniques and technology. Fabrication and testing of a digital tropospheric scatter modulator/demodulator was completed in FY1982. Electronic Counter Counter Measures (ECCM) antennas for digital radios will be developed in FY1983 with follow-on development of an ECCM radio subsystem in FY1984.

D. (U) Project 2206 Digital European Backbone (DEB). Under this project, a digital transmission system is being installed in four phases in Europe. DEB is a follow-on to the prototype digital transmission system now in operation between Frankfurt and Vaihingen, Germany. DEB equipment replaces obsolete analog equipment, improves security, and increases capacity. It is the first major digital transmission system in the DCS. DEB Stage II was begun in FY1982 with the installation of digital equipment at Friolzheim, Germany. Initial operational capability of DEB Stage II will occur in FY1984 and continued installation will take place throughout Europe.

E. (U) Project 2440 Secure Voice Improvement Program (SVIP). SVIP is a tri-Service program, with the Army as executive agent, to provide a high quality worldwide DOD secure voice network. The program was restructured in FY1979 per congressional direction and currently includes the acquisition of the Automatic Secure Voice Communicications (AUTOSEVOCOM) Life Cycle Extension Program (ALCEP) modulation/demodulation equipment. Follow-on development of improved secure voice capability is scheduled for FY1985. In FY 1983 funds were used to analyze user requirements for secure voice radio interfaces to command and control aircraft. FY 1984 funds will be used for joint service testing of the STU-IIM secure voice terminal, with procurement to follow in FY 1985.

F. (U) Project 2953 Movements Information Network (MINET). MINET is a program to provide a tri-service logistics network in Europe. The Air Force RDT&E funding support will be $1.0M in FY1983 and $1.2M in FY1984. There is no projected RDT&E funding beyond FY1984. FY 1983 funds supported tri-service implementation, operation and maintenance of the MINET packet switch test bed, consisting of eleven nodes. In FY 1984 the test bed will be expanded to fourteen nodes and testing will continue. In FY 1985, MINET will be integrated into the then-operational Defense Data Network (DDN), with Operations and Maintenance funding to be borne by DDN.

G. (U) Project 2981 Defense Data Network (DDN). Programmed funds represent Air Force share of DDN development by the Defense Communications Agency. The DDN will ultimately replace the existing common-user data network (AUTODIN) and provide high speed, multi-level secure, packet switching communications.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #33144F
DOD Mission Area: #363 - Common User Communications

Title: Electromagnetic Compatibility Analysis Center (ECAC)
Budget Activity: #5 - Intelligence and Communications

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	6,965	7,251	7,122	6,900	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Electromagnetic Compatibility Analysis Center (ECAC) is a Department of Defense Center operated by the Air Force. The creation of the Center stemmed from recognition that action was required to cope with the increasing number and severity of electromagnetic compatibility problems. The Center is tasked with the responsibility of developing a communications-electromagnetic systems data base and the analysis tools necessary to determine if these systems will operate in their intended electromagnetic environment. This program element provides core funding to support data base and analysis capability development as well as specific analysis tools requested in support of the Secretary of Defense and the Joint Chiefs of Staff. Analyses performed in support of Department of Defense component's operational and developmental systems are performed on a user reimbursement basis.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($/In Thousands)

RDT&E	6,880	7,251	7,239	----	Continuing	Not Applicable

Deltas to the FY 84 resources are as follows: FY 82 increase was a Congressional adjustment of $.095M. FY 84 delta is due to a $.117M undistributed reduction to meet overall budget requirements.

4. (U) OTHER APPROPRIATION FUNDS:

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Operation and Maintenance	4,011	4,074	4,288	4,526	Continuing	N/A

5. (U) RELATED ACTIVITIES: The Center performs electromagnetic analyses for major Department of Defense communication-electronics systems. These system analysis projects are funded by reimbursements from users. These reimbursed funds are estimated to be $25.9 million in FY 83, $28.4 million in FY 84 and $30.1 million in FY 85. In FY 82 for example, more than 250 separate projects for the Army, Navy, Marine Corps and Air Force were supported. In addition, approximately 60 other Department of Defense, joint agency, and other Federal agency projects were addressed by the Electromagnetic Compatibility Analysis Center (ECAC). Examples of the systems being analyzed are: Air Force E-3 and E-4 aircraft, Joint Tactical Information Distribution System (JTIDS), Air Force Strategic Satellite System and Global Positioning

Program Element: #33144F
DOD Mission Area: #363 - Common User Communications

Title: Electromagnetic Compatibility Analysis Center (ECAC)
Budget Activity: #5 - Intelligence and Communications

System; Army - Communications Command System, Airborne Frequency Engineering Management System, Patriot Missile System, Tactical Frequency Engineering System; Navy - EA-6B Prowler, Special Electromagnetic Interference Project, Surface Missile System (AEGIS), and PHALANX; and Marine Corps - Tactical communications electromagnetic compatibility analysis and operational support. Efforts of mutual concern to the Department of Defense and other Federal Agencies (i.e., Federal Communications Commission, Federal Aviation Administration) include projects such as the Microwave Landing System, Air Traffic Control Frequency Assignment System, Air-Ground-Air Frequency Assignment Program, and Communications and Control Systems. The Center also exchanges data, math models, and computer programs with other agencies involved in frequency management such as the Department of Commerce, Interdepartment Radio Advisory Committee and the the National Telecommunications and Information Administration (NTIA).

6. (U) WORK PERFORMED BY: The Electromagnetic Compatibility Analysis Center is located in Annapolis, MD. The contracting responsibility is performed by Headquarters, Air Force Systems Command through the Electronic Systems Division, Hanscom AFB, MA. The current contractor is the IIT Research Institute, Chicago, IL.

7. (U) ELECTROMAGNETIC COMPATIBILITY ANALYSIS CENTER (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984):

A. (U) Detailed Background and Description: The Electromagnetic Compatibility Analysis Center (ECAC) is a Department of Defense (DOD) facility established to provide advice and assistance on electromagnetic compatibility (freedom from radio interference) problems to the Secretary of Defense, Joint Chiefs of Staff, the military departments and other DOD components. The Center, at Annapolis, MD, is managed by the Air Force, but is available to all DOD users. The chairman of the Joint Chiefs of Staff and the Assistant Secretary of Defense for Communications, Command, Control and Intelligence jointly provide policy guidance, assign projects and establish project priorities. The Center consists of an Air Force Commander, Deputies for Army, Navy, Marine Corps, Air Force, and Special Projects, and an in-house technical management staff assisted by a contractor. The Center's primary function is the analysis of inter-system and system-to-environment electromagnetic compatibility. The purpose of these analyses is to determine whether Department of Defense communications-electronics systems, in use or under development, will operate in current and projected electromagnetic environments. These analyses include consideration of the impact of the expected electromagnetic environment on both civilian and military telecommunications equipment and consideration of efficient use of the available frequency spectrum to enhance spectrum management. Other analyses performed are those on frequency allocations and assignments in support of the frequency management in the military departments and the Unified and Specified commands. To perform the required analyses, the Center maintains and develops basic analysis techniques including models, prediction analysis system and special techniques. In addition to the analysis techniques, the Center maintains and develops an extensive environmental data base which contains millions of pieces of data to perform the electromagnetic compatibility analyses. The data base files include information on the location and operating characteristics of United States and foreign equipment and systems, the equipment complements of specific vehicles or platforms (ship, army, units, aircraft, etc.), the allocation and use of the frequency spectrum and all associated United States and International rules and regulations, digitized topographic data (U.S. and other nations), and future communications-electronics (C-E) equipments and systems in development or conceptual stages. The Center also provides the necessary facilities to perform its mission. This includes computer rental and operations, administrative support, purchased supplies and services, building rental, and contract functions. The Research, Development, Test and Evaluation (3600) funds primarily provide for development and maintenance

Program Element: #33144F
DOD Mission Area: #363 - Common User Communications

Title: Electromagnetic Compatibility Analysis Center (ECAC)
Budget Activity: #5 - Intelligence and Communications

of the analytical capabilities, development of additional data base requirements and government support. The Operation and Maintenance funds (3400) primarily support operational analysis projects of the military services and data base maintenance.

B. (U) Program Accomplishments and Future Efforts: In recents years, the program element funding provided the operation, maintenance and administration, updating to data, and the continued development of electromagnetic capability analysis. Timely short term responses to operational problems from Southeast Asia, Europe, and the Continental United States were provided. Frequency assignment analyses have been continuous. Analyses of equipment, proposed or in research and development, have been documented in technical reports. The Center analyzed and formulated the Department of Defense and Services positions relative to the General Worldwide Administrative Radio Conference (GWARC) which was held in Geneva during 1979. The Center will again support the GWARC representatives in 1984 and is preparing for that meeting in the 1982-83 time frame. In FY 1981, the ECAC manpower to support its mission was 54 military/civil service and approximately 600 contractor personnel.

(1) (U) FY 1982 Achievements: Research, Development, Test and Evaluation (RDT&E) funding provided continued data base and Frequency Records Resource System development and the expansion of analytical model capabilities in many areas of electromagnetic compatibility solution. The analysis project effort expended with demand of Defense and other government agencies for analysis services continues to increase. The majority of analysis projects, for both defense and non-defense activities, are financially supported by those activities through reimbursement.

(2) (U) FY 1983 Program: The FY 1983 program will be similar in content to the efforts described above. It is anticipated that as systems become more complex and the number of frequency spectrum users grow, the interference problems and requests for analysis and data will increase. The level of effort expended on work directly funded under this program will be held approximately constant while the amount of user reimbursement work is expected to grow about two percent.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The requirement for electromagnetic analysis is increasing because of the growing number and complexity of communications-electromagnetic systems. This program will develop and maintain improved analytical tools and data bases and make these capabilites available to all Department of Defense users. Examples of the wide variety of systems which will be supported in FY 1984 include the MX Ground Sites EMC Analysis and Compass Call Electronic Warfare platform. Joint Tactical Information Distribution System, Worldwide Airborne Command Post E-4B Aircraft and Marine Corps Foliage Penetration Battlefield Surveillance Radar System. In addition, this program will support the Secretary of Defense and Joint Chiefs of Staff in spectrum allocation/assignment and special electromagnetic compatibility analysis projects. The estimated costs are based on past program experience adjustments for expected cost growth and projected workload to support the above projects.

(4) (U) Program to Completion: This is a continuing program.

C. Major Milestones: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 33401F | Title: Communications Security (COMSEC)
DOD Mission Area: #364 - COMSEC | Budget Activity: #5 - Intelligence and Communications

1. RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	1,594	1,621	[ ]	[ ]	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The principal objective of this program is the improvement of communications security within the United States Air Force. It is a continuing effort divided into several task areas. The overall effort is part of national communications security program managed by the National Security Agency with participation by other services/agencies. The Air Force portion of this overall program addresses problems encountered in adapting general purpose cryptographic equipment for use in new communication systems. The efforts are primarily directed at insuring that all systems being developed by the Air Force meet current national communication security requirements. Specific emphasis is placed on correcting any known deficiencies.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	1,594	1,621	1,593		Continuing	N/A
Procurement	Not Applicable					

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable

5. (U) RELATED ACTIVITIES: The National Security Agency is the overall manager of communications security equipment research and development under the policy guidance of the Assistant Secretary of Defense (Communications, Command, Control and Intelligence). The services perform efforts under common Program Element #33401. The Air Force Electronic Security Command performs COMSEC testing on off-the-shelf equipment selected for operational use in the USAF and also recommends the use of cryptographic equipment to operational commands.

6. (U) WORK PERFORMED BY: All research and development tasks under this program are managed through the Rome Air Development Center of the Air Force Systems Command, Electronic Systems Division, Hanscom AFB, MA. Contractors are: Lincoln Laboratory, Bedford, MA; Arcon Corp., Bedford, MA; Hughes Aircraft Co., Irvine, CA; IDEAS Inc., Beltsville, MD; National Bureau of Standards, Boulder, CO; and six other contracts valued at $250,000.

Program Element: # 33401F
DOD Mission Area: #364 - COMSEC

Title: Communications Security (COMSEC)
Budget Activity: #5 - Intelligence and Communications

7. (U) COMSEC (SINGLE PROJECT LESS THAN $10 MILLION IN FY 84)

A. (U) Project Description: The purpose of this program is to develop the technology required by the Air Force to integrate NSA developed COMSEC equipment into systems and to support the Electronic Security Command (ESC) in performing its "compromising emanations" mission.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Developed and tested techniques for reducing harmful effects of ambient aircraft noise on narrowband secure voice systems. Developed and tested techniques for very low bit rate digital voice systems. Began development of an Intrusion Resistant Fiber Optic System. Developed and transitioned an antenna calibration facility and an optical modulator for TEMPEST testing.

(2) (U) FY 1983 Program: Increase level of technology development to support secure voice in satellite systems and systems with Electronic-Counter-Counter-Measures (ECCM) requirements. Continue performing as Test Agent for the DOD Digital Voice Consortium. Complete development and testing of the Intrusion Resistant Fiber Optic System. Expand programs for automated TEMPEST test and analysis to reduce labor intensive aspects of the mission.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Develop and test a new 16 Kbs packetized digital voice systems to permit high quality secure voice in staff offices, command centers, and at executive level. Initiate development of programmable COMSEC systems for local area networks based on research in programmable control and novel key distribution concepts currently sponsored by Air Force and NSA.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: N/A

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 35114F
DoD Mission Area: #357, Navigation and Position Fixing

Title: Traffic Control and Landing Systems (TRACALS)
Budget Activity: #5, Intelligence & Communications

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	5,280	4,345	6,269	7,798	Continuing	N/A
1956	TPN-19 Improvements	474					2,474
2026	System Support	457	285	270	270	Continuing	N/A
2148	LORAN C/D	1,350					26,350
2610	Berlin Long Range Radar	370	759				1,526
2681	CPN-22 Electronic Counter-Countermeasures	2,629	2,900	2,574			8,303
2760	Mobile Planar Array		401	1,125			1,526
2759	Microwave Landing System			2,300	2,575	52,100	56,975
2966	Rapidly Deployable Air Traffic Control System				2,533	24,600	27,133
2967	Air Traffic Control Survivability				2,420	10,300	12,720

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION: This program provides the Air Force with the Air Traffic Control and Landing equipment required for safe, efficient, worldwide, all weather Air Force flying operations. The mission need is to provide take off, enroute and landing guidance and surveillance in order to meet wartime sortie requirements. In peacetime, the need is to support training, logistics and other operational flying with maximum safety.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

RDT&E	5,280	5,060	3,907	Continuing	N/A
Procurement (Other)	4,213	399	2,591	Continuing	N/A

(U) The FY83 RDT&E estimate is $700 thousand less than reported in the FY83 Descriptive Summary. The funds requested for program definition of an Advanced Military Landing System (Project 2759) were not supported in the FY83 Defense Authorization Bill. The program has been restructured for an FY84 new start to emphasize early acquisition of variants of the civil Microwave Landing System for tactical use and acquisition of fixed base equipment in a combined program with the Federal Aviation Administration. The project has been renamed to indicate identity with the civil program. A $6.5 million increase in total program RDT&E cost reflects a later start in military avionics development and aircraft integration work.

Program Element: # 35114F Title: Traffic Control and Landing Systems (TRACALS)
DoD Mission Area: #357, Navigation and Position Fixing Budget Activity: #5, Intelligence & Communications

The FY84 RDT&E estimate is increased by $2.574 million in project 2681 and related other procurement funds are slipped from FY84 to FY85. The project provides an electronic counter-countermeasures capability for the two AN/GPN-22 precision approach radars to be installed in Berlin. Contract negotiations in early FY82 verified the possibility of [ ] Cost to achieve this greater capability was negotiated at about $2.6 million more than originally anticipated. This submission funds the increase by deferring acquisition of a second system into FY85 and using the FY84 Other Procurement funds projected last year to complete the development and test of a prototype. Some $300 thousand of the increase additionally develops and tests a [ ] This device provides additional anti-jam margin during final approach to Berlin. [ ]

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Procurement (Other)	4,115	390	0	6,157	Continuing	N/A
2681 GPN-22 ECCM						
$				3,177		
QTY				1		
2760 Mobile Planar Array						
$				2,945		
QTY				25		
2759 Microwave Landing System						
Fixed Base (FAA)						
$					250,000	250,000
QTY					200	200
Tactical/Transportable						
$					150,000	150,000
QTY					100	100
Combat Operating Base						
$					125,000	125,000
QTY					100	100
2966 Rapidly Deployable ATC System						
$					514,250	514,250
QTY					25	25

Program Element: # 35114F   Title: Traffic Control and Landing Systems (TRACALS)
DoD Mission Area: #357, Navigation and Position Fixing   Budget Activity: #5, Intelligence & Communications

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
2967 ATC Survivability						
$					51,165	51,165
QTY						
ECCM Mods					20	20
ARM Alarm					52	52
Quick Restoral Sensor					50	50
Procurement (Aircraft)						
2759 Microwave Landing System Commercial Receivers						
$					120,000	120,000
QTY					2,500	2,500
Military Receivers						
$					457,500	457,500
QTY					6,500	6,500
2681 AN/GPN-22 ECCM Passive Reflectors						
$			300			
QTY			36			
Military Construction						
2967 RAPCON Hardening						
$				2,800	41,900	44,700
QTY				1	14	15
Funds from Federal Republic of Germany for Berlin Radar Project 2610	(19,100)	(8,100)	(14,400)	(15,700)		(65,100)

5. (U) RELATED ACTIVITIES: Microwave Landing System (MLS). This system has been developed and tested by the Federal Aviation Administration. Fixed base ground equipment for the Air Force will be acquired under FAA contract. RDT&E funds in this request accomplish three tasks: 1) engineering development of tactical/transportable ground equipment; 2) aircraft integration and test of commercial MLS avionics for use on tanker/transport type aircraft, and; 3) development and test of avionics capable of providing a category II landing capability for fighter type aircraft. The vast majority of RDT&E funds projected through the 1990s concentrate on this last effort. The Navy's Multimode Receiver program may have application to the Air Force's need for fighter avionics but its use will not appreciably reduce RDT&E requirements as RDT&E funds are used to integrate avionics into weapon systems on a platform by platform basis. The Global Positioning System will be investigated as an alternative to the precision distance measuring equipment required on civil aircraft as part of the MLS avionics subsystem. If GPS may be used for this function, considerable savings in avionics acquisition costs are possible.

Program Element: # 35114F
DoD Mission Area: #357, Navigation and Position Fixing

Title: Traffic Control and Landing Systems (TRACALS)
Budget Activity: #5, Intelligence & Communications

Air Traffic Control Survivability. One portion of this project provides protection against the Anti-Radiation Missile threat to airport surveillance radars at combat operating bases in Europe and Korea. Anti-Radiation Missile Alarms developed under the Tactical Air Control System Improvement Program (P.E. 27412F) will be used.

6. (U) WORK PERFORMED BY:

Sanders Associaties, Inc. Nashua, New Hampshire - Phase 3 Berlin Radar Program (Project 2610); General Electric Company, Fairfield, Connecticut - Phase 2 Berlin Radar Program (Project 2610); Raytheon Company, Sudbury, Massachusetts - AN/TPN-19 Improvements (Project 1950) and AN/GPN-22 ECCM (Project 2681); Sperry Gyroscope, Great Neck, Long Island, New York - LORAN C/D (Project 2148); AIL, Farmingdale, New York - Phase 1 Berlin Radar Program (Project 2610);

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: 2026 - System Support. This project provides planning support to all Traffic Control and Landing System acquisition projects. It funds travel and small study contracts in support of preprogram costing and definition efforts. FY 1982/3 efforts are defining program requirements for the FY 1984 Microwave Landing System new start as well as travel supporting some Air Force System Command managed projects which require no RDT&E funds. FY 1984 efforts will support FY 85 new starts for Air Traffic Control Survivability and a Rapidly Deployable Air Traffic Control System (a replacement for the 1950s vintage AN/MPN-14 mobile radar approach control).

B. Project: 2681 - AN/GPN-22 Electronic Counter - Countermeasures (ECCM). This project develops, tests and acquires an ECCM capability for the two AN/GPN-22 precision approach radars to be installed at Tegel and Templehof airports in Berlin. FY 1982/3 efforts develop an ECCM capability. The FY 1984 request funds modification and test of one radar. If testing validates a [ ] a second system will be modified in FY 1985 with Other Procurement funds. An included RDT&E effort is development and test of a [ ] provides added anti-jam margin on final approach. [ ] will be acquired in FY 1984 if unit cost is as low as anticipated (less than $5000). The purpose of both this project and the Berlin Radar Program, which is funded principally by the Federal Republic of Germany, is to assure that U.S. air access to Berlin cannot be denied [ ]

C. (U) Project: 2760 - Mobile Planar Array. The current Air Traffic Control Radar Beacon system is subject to false target returns which impede an air traffic controller's ability to separate traffic. In a joint acquisition with the Federal Aviation Administration the Air Force is acquiring open planar array antennas for all of its fixed base air traffic control radars. The open planar array reduces false targets by 90 per cent. These RDT&E funds develop and test a modified version of the open planar array to be used on mobile air traffic control radars. Size, weight and mobility considerations preclude use of the antenna bought for fixed sites. FY 1983 efforts lead to a contract for prototypes to mate with the AN/TPN-19 and AN/MPN-14 mobile radars. FY 1984 funds pay for fabrication and test. Modification kits will be acquired and installed in FY 1985 if testing is successful.

Program Element: # 35114F
DoD Mission Area: Navigation and Position Fixing #361

Title: Traffic Control and Landing Systems (TRACALS)
Budget Activity: Intelligence & Communications #5

D. (U) Project: 2759 - Microwave Landing System. NEW START. This is a twenty year program whose ultimate purpose is to convert the Air Force from use of Precision Approach Radar (PAR) and the Instrument Landing System (ILS) to use of the international standard Microwave Landing System (MLS) for all tactical and fixed base precision landing operations. This conversion will: 1) provide for continued interoperability with civil landing systems; 2) remove the military limitations of precision aproach radar (i.e. limited mobility, vulnerability, high manpower cost, site sensitivity) and ILS (i.e. vulnerability, no mobility, siting restrictions); 3) provide for operations to lower minimums than current systems usually achieve; 4) provide a new capability for all weather operations into austere airstrips, and; 5) assure continued landing system interoperablity with NATO which has also agreed to transition to MLS. By the year 2000, all Air Force bases and all Air Force aircraft will be equipped with MLS ground equipment and receivers. Per Defense Guidance, acquisition of both ground equipment and avionics will be paced to civil sector plans with most acquisition costs incurred in the 1988-1996 time frame. The overall MLS program will consist of four separate acquisition projects. The FY 1984 request solicits funds for only one of the projects but all are addressed below to show the relationship of the new start to long term plans and to identify the ultimate funding commitment.

(U) Tactical System - The FY 1984 funds requested apply entirely to this effort. Military Airlift Command is responsible for initial deployment, forward area supply and medical evacuation of Army maneuver forces, particularly in rapid deployment scenarios. MAC has no all weather landing capability into austere forward airstrips to support these missions. The Air Force's first priority in its MLS program is to rectify this deficiency. FY 1984-1986 RDT&E funds and FY 1987-89 Aircraft and Other Procurement funds will be applied to: 1) developing, testing and deploying a modular, civil interoperable tactical Microwave Landing System based on the FAA developed MLS and prior work done by the Army on the Joint Tactical Microwave Landing System and; 2) adapting commercial MLS avionics expected to be available in late 1983 for installation on MAC C-130 and C-141 aircraft. Installation of MLS avionics on MAC aircraft in support of the tactical program will have the added advantage of assuring MAC worldwide civil interoperability as MLS is introduced beginning in 1985. The tactical program will initially acquire 60 sets of ground equipment and modify 600-800 aircraft. Initial operating capability is planned for the second quarter of FY 1988 (5 ground sets and 50 C-130s) but efforts are in progress to accelerate this date by up to a year. Army participation is being staffed. The Navy/Marine multi-mode receiver will interoperate with ground equipment. Additional ground equipment may be acquired in the 1990s as back up to fixed base equipment at combat operating bases in Europe and Korea. Total cost for the tactical program is about $10 million in RDT&E from FY84 through FY86, some $70 million for 60 ground systems from FY87 to FY89, and some $50 million for 600 aircraft modifications. RDT&E funds are not meant to reinvent MLS but to engineer and test equipment suitable for quick erection in an austere tactical environment. A third of the RDT&E money funds flying hours for test and evaluation.

(U) Fixed Base System - The Air Force will acquire equipment for its bases in the United States as part of FAA's second buy beginning in 1987. Equipment will be identical. OSD direction is pending designating the Air Force as lead service for managing DoD participation in the FAA program. The acquisition schedule will be paced by aircraft avionics equippage and civil sector progress.

(U) Standard Military Avionics - Off-the-shelf commercial avionics will not be suitable for high performance military aircraft. A development program for a standard airborne receiver will be initiated in FY87 with acquisitions from FY 89-98. Some 6500 aircraft must be equipped. The Navy's multi-mode receiver will be evaluated as a possible solution as will the use of GPS in lieu of the precision distance measuring equipment which is part of an MLS receiver. The vast majority of RDT&E funds projected through the 1990s are to integrate the receiver into weapons systems. Though sometimes funded with aircraft procurement funds in individual weapon system program elements, the Air Force has chosen to present this as an up front cost to provide a clearer picture of the scope of the program. Additional commercial avionics procurements are likely for tankers and support aircraft after conclusion of the tactical program. Costs for acquisitions in the 1990s are not at all firm. If civil sector ILS/MLS conversions lag, more aircraft can be equipped during initial production at a cost saving. If civil sector conversion proceeds rapidly, more modifications will be necessary at higher cost but it may not then be necessary to equip aircraft for both ILS and MLS during the transition. The costs stated are median estimates subject to wide variance. Modifications and the cost to acquire receivers for installation in new production aircraft will not be funded in this Program Element but total costs are stated to define the magnitude of the MLS program.

(U) Combat Operating Base System - Bases in Europe and Korea may be equipped either with hardened versions of the civil system procured for use in the United States or shelterized versions of the tactical, mobile system. Either version must have the capability to vary the location of the elevation antenna to allow operation from surviving segments of damaged runways. The system operational concept is still being defined. No funds will be spent on this portion of the program until at least 1987. The U.S. is committed to NATO to equip main operating bases for MLS service by 1998.

E. Project 2966 - Rapidly Deployable Air Traffic Control System. This is a planned FY85 new start. Comments are provided due to its importance and the magnitude of the resources involved. This project replaces 32 AN/MPN-14 mobile radar approach control facilities of 1950's vintage. The AN/MPN-14 will be logistically unsupportable in 1985 and can be continued until this replacement is available[ ] Aside from its age, the AN/MPN-14 is outsized cargo limiting its ability to be deployed rapidly[ ] Because the Air Force has 10 deployable (1 depot) AN/TPN-19 high capacity mobile radar approach controls of recent vintage, the AN/MPN-14 replacement will be designed for operation at low capacity forward area expeditionary airfields. It will be C-130 transportable, rugged, designed for repair of battle damage and equipped to operate in a collateral jamming environment. Twenty-five systems will be procured for the active Air Force and Air National Guard. Extensive test of a prototype acquired with RDT&E funds is planned. Existing technology will be used. Radar approach controls support the tactical mission by sequencing aircraft and providing departure/landing guidance. This allows clear weather sortie rates to be sustained at night and in adverse weather and battle damaged aircraft to be recovered at a higher rate than would otherwise be the case.

F. Project 2967 - Air Traffic Control Survivability. This 1985 new start is designed to increase the survival prospects for fixed base radar approach control facilities in Europe and Korea. Separate activities provide AN/GPN-20 radars[ ] harden operations facilities against collateral damage from airfield attack, acquire the Anti-Radiation Missile Alarm being developed for the Tactical Air Control System and make provisions for continuity of operations if, despite all other measures, radar service is lost. Previous survival projects have provided[ ] a quick restoral TACAN and made provisions for back up control tower services. Better operating capability in a chemical warfare environment is addressed in other Air Force programs not in this program element. The combination of all activities is expected to make air traffic control services as survivable as the ability of the base to generate combat sorties.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #35164F
DOD Mission Area: #361 - Navigation and Position Fixing

Title: NAVSTAR Global Positioning System (User Equipment)
Budget Activity: #5 - Intelligence and Communications

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

PROJECT NUMBER	TITLE	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT			6,776	9,289	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF PROGRAM ELEMENT AND MISSION NEED: This program element funds R&D to integrate GPS user equipment into Air Force airborne and ground platforms. It also funds production and installation of GPS equipment and development of aircraft modifications necessary to complete the installations. Military forces need to know precise location to enhance command and control and to engage in strategic and tactical warfare. A global, common grid positioning and navigation system is required to increase both accuracy and the availability of current weapon systems, especially at night and in adverse weather, thus significantly increasing their effectiveness. GPS satellites will also carry the Integrated Operational NUDET Detection System (IONDS) as an additional payload to detect and locate nuclear detonations. The GPS Mission Element Need Statement was revalidated by the Secretary of Defense at Milestone II.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

TOTAL FOR PROGRAM ELEMENT N/A

(U) The Air Force GPS avionics program has been accelerated one year in the FY 84 President's Budget. As there were originally no RDT&E funds in either FY 83 or FY 84, a Descriptive Summary was not required.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

AIRCRAFT PROCUREMENT	19,700	Continuing	N/A
(Qty)	(32)		

(U) GPS Full Scale Development R&D is funded in PE 64778F. GPS space and ground segment procurement and preplanned product improvements are funded in PE 35165F.

5. (U) RELATED ACTIVITIES: The joint program manager coordinates the supporting activities of the Army, Navy, Marine Corps, Defense Mapping Agency, Department of Transportation and North Atlantic Treaty Organization through his deputies in the Joint Program Office. The use of the Global Positioning System for providing guidance corrections for tactical missiles is being separately explored under Program Element 63601F, Conventional Weapons Technology. Investigation of advanced anti-jamming technology is conducted under Program Element 63203F, Advanced Avionics for Aircraft. Program

Element 64778F also supports the Navy's Fleet Ballistic Missile Programs (Program Element 11221N Fleet Ballistic Missile Systems).

(U) The North Atlantic Treaty Organization Global Positioning System Project, a cooperative venture between the United States and nine other nations, provides information to these nations to assist in making decisions about adopting the system for military forces.

(U) Full Scale Development of user equipment is funded by all services under Program Elements 64777N and 64778A/F NAVSTAR Global Positioning System for the Navy, Army and Air Force, respectively. The Air Force also funds satellite development and ground control segment development/deployment in this PE. Funds to procure the inital 28 satellites via a multiyear block buy, to procure follow-on replenishment satellites, and to develop preplanned product improvements to GPS are in PE35165F, NAVSTAR GPS Space and Control Segments. RDT&E and procurement funds to integrate GPS user equipment into Air Force ground and airborne platforms is in PE 35164F NAVSTAR GPS User Equipment.

(U) The IONDS payload will be flown on all remaining first generation GPS satellites (NAVSTARs 8-11) and on all operational satellites. Program Elements 31357F and 12433F, Integrated Operational Nuclear Detonation Detection System, funds IONDS payloads. Expendable launch services (Atlas E/F) are funded under Program Element 35119F, Space Boosters. Space Shuttle launches are funded under Program Element 35171F, Space Launch Support.

6. (U) WORK PERFORMED BY: The Joint Program Office is located at the Air Force Systems Command's Space Division, El Segundo, CA. There is a competitive User Equipment/development, with Magnavox Advanced Products and Systems Co., Torrance, CA, and Rockwell International/Collins Government Avionics Div., Cedar Rapids, IA as the competitors. Intermetrics, Cambridge, MA, is the user equipment software independent verification/validation contractor.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: NAVSTAR Global Positioning System User Equipment

A. (U) Project Description: The NAVSTAR Global Positioning System (GPS) is a spaced-based 18 satellite radio positioning and navigation system designed to provide users with worldwide, all weather , three-dimensional position (16 meter SEP), velocity (.1 meter/sec) and precise time (within .1 microsecond). GPS provides a common navigation grid for land, air and sea units for coordinated operations. GPS dramatically improves our strategic target mapping capability, the probability of target acquisition, low-level ingress/egress, flexible routing, and the accuracy of delivered weapons. These features, along with a capability for highly accurate passive operations, enhance the force effectiveness and survivability of many US weapon systems. GPS consists of three segments. The space segment produces the worldwide navigation signals. It consists of the 18 satellite constellation plus 3 on orbit spares. The control segment consists

Program Element: #35164F Title: NAVSTAR Global Positioning System (User Equipment)
DOD Mission Area: #361 - Navigation and Position Fixing Budget Activity: #5 - Intelligence and Communications

of five Monitor Stations and three Ground Antennas (located around the world) and a Master Control Station (MCS), which will be a tenant in the Consolidated Space Operations Center. The Monitor Stations measure satellite performance parameters which are evaluated and corrected by the MCS and then forwarded to the satellites by the Ground Antennas. The user segment consists of the avionics and interfaces necessary to receive and process GPS satellite signals into position, velocity, and time data for various military users.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: User equipment development continued under PE 64778F with both contractors finishing critical design reviews of the user sets and their interfaces with the test platforms.

(2) (U) FY 1983 Program: User equipment development will continue with integration of preproduction user equipment from both competitors into Phase II host vehicles. Development testing began in preparation for initial operational test and evaluation and a subsequent production decision. The Air Force test vehicles are the F-16 and the B-52G.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: PE 64778F funds completion of the Air Force portion of the user equipment development and initial operational test and evaluation in eight joint service platforms. R&D fund in PE 35164F funds completion of development of the B-52G integration kit and initiates development of an integration kit for the E-3. A production DSARC is planned for May 1984. The FY 84 aircraft procurement funds will be used to initiate user avionics production tooling. Cost estimates are based on parametric evaluation of the costs to perform the R&D effort. A DoD level review of the GPS cost estimate was last completed in November 1982.

(4) (U) Program to Completion: Integration of GPS user equipment into approximately 10,000 Air Force airborne and ground platforms will continue through 1996.

C. (U) Major Milestones:

Milestones	
Defense Systems Acquisition Review Council II	2 Q CY 79
Begin Satellite Production	3 Q CY 82
Begin User Avionics IOT&E	3 Q CY 83
Defense Systems Acquisition Review Council III	2 Q CY 84
Begin User Avionics Production	3 Q CY 84
Shuttle Launch First Satellite	4 Q CY 85
Achieve Worldwide 2-D Capability	2 Q CY 87
Achieve Worldwide 3-D Capability	4 Q CY 88

3-D Satellite capability slipped one quarter due to time required to reprogram procurement funds and intitiate production.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #35165F
Title: NAVSTAR Global Positioning System (Space/Grd Segments)
DOD Mission Area: #361 - Navigation and Position Fixing
Budget Activity: #5 - Intelligence and Communications

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

PROJECT NUMBER	TITLE	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT			27,143	32,346	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF PROGRAM ELEMENT AND MISSION NEED: This program element funds procurement and operation of the NAVSTAR GPS satellites and control segment. Starting in FY 84, RDT&E for Pre-Planned Product Improvements will be initiated. Military forces need to know precise location to enhance command and control and to engage in strategic and tactical warfare. A global, common grid positioning and navigation system is required to increase both accuracy and the availability of current weapon systems, especially at night and in adverse weather, thus significantly increasing their effectiveness. GPS satellites will also carry the Integrated Operational NUDET Detection System (IONDS) as an additional payload to detect and locate nuclear detonations. The GPS Mission Element Need Statement was revalidated by the Secretary of Defense at Milestone II.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

TOTAL FOR PROGRAM ELEMENT These funds were identified as missile procurement in FY 83.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total
MISSILE PROCUREMENT:	20,100	101,400	238,621	299,641	Continuing	N/A
(Order Qty/Full Fund)		(28/0)	(0/1)	(0/6)		
MILITARY CONSTRUCTION			7,300			7,300

GPS Full Scale Development is funded in PE 64778F. User Equipment production is funded in PE 35164F.

5. (U) RELATED ACTIVITIES: The joint program manager coordinates the supporting activities of the Army, Navy, Marine Corps, Defense Mapping Agency, Department of Transportation and North Atlantic Treaty Organization through his deputies in the Joint Program Office. The use of the Global Positioning System for providing guidance corrections for tactical missiles is being separately explored under Program Element 63601F, Conventional Weapons Technology. Investigation of advanced anti-jamming technology is conducted under Program Element 63203F, Advanced Avionics for Aircraft. Program Element 64778F also supports the Navy's Fleet Ballistic Missile Programs (Program Element 11221N Fleet Ballistic Missile Systems).

Program Element: #35165F Title: NAVSTAR Global Positioning System (Space/Grd Segments)
DOD Mission Area: #361 - Navigation and Position Fixing Budget Activity: #5 - Intelligence and Communications

(U) The North Atlantic Treaty Organization Global Positioning System Project, a cooperative venture between the United States and nine other nations, provides information to these nations to assist in making decisions about adopting the system for military forces.

(U) Full Scale Development of user equipment is funded by all services under Program Elements 64777N and 64778A/F NAVSTAR Global Positioning System for the Navy, Army and Air Force, respectively. The Air Force also funds satellite development and ground control segment development/deployment in this PE. Funds to procure the inital 28 satellites via a multiyear block buy, to procure follow-on replenishment satellites, and to develop preplanned product improvements to GPS are in PE35165F, NAVSTAR GPS Space and Ground Segments. RDT&E and procurement funds to integrate GPS user equipment into Air Force ground and airborne platforms is in PE 35164F NAVSTAR GPS User Equipment.

(U) The IONDS payload will be flown on all remaining first generation GPS satellites (NAVSTARs 8-11) and on all operational satellites. Program Elements 31357F and 12433F, Integrated Operational Nuclear Detonation Detection System, funds IONDS payloads. Expendable launch services (Atlas E/F) are funded under Program Element 35119F, Space Boosters. Space Shuttle launches are funded under Program Element 35171F, Space Launch Support.

6. (U) WORK PERFORMED BY: The Joint Program Office is located at the Air Force Systems Command's Space Division, El Segundo, CA. The satellite contractor is Rockwell International/Space Operations and Satellite Systems Division, Seal Beach, CA; International Telephone and Telegraph, Nutley, NJ, is the subcontractor for the navigation subsystem. Aerospace Corp., El Segundo, CA, provides technical and engineering support. Operational Control Segment development/deployment is being done by International Business Machines/Federal Systems Div., Gaithersburg, MD. Logicon, Long Beach, CA, is the software independent verification/validation contractor.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: NAVSTAR Global Positioning System (Space/Ground Segments)

A. (U) Project Description: (U) The NAVSTAR Global Positioning System (GPS) is a spaced-based 18 satellite radio positioning and navigation system designed to provide users with worldwide, all weather, three-dimensional position (16 meter SEP), velocity (.1 meter/sec) and precise time (within .1 microsecond). GPS provides a common navigation grid for land, air and sea units for coordinated operations. GPS dramatically improves our strategic target mapping capability, the probability of target acquisition, low-level ingress/egress, flexible routing, and the accuracy of delivered weapons. These features, along with a capability for highly accurate passive operations, enhance the force effectiveness and survivability of many US weapon systems.

(U) GPS consists of three segments. The space segment produces the worldwide navigation signals. It consists of the 18 satellite constellation plus several on orbit spares. The control segment consists of five Monitor Stations and three

Program Element: #35165F Title: NAVSTAR Global Positioning System (GPS)
DOD Mission Area: #361 - Navigation and Position Fixing Budget Activity: #5 - Intelligence and Communications

Ground Antennas (located around the world) and a Master Control Station (MCS), which will be a tenant in the Consolidated Space Operations Center. The Monitor Stations measure satellite performance parameters which are evaluated and corrected by the MCS and then forwarded to the satellites by the Ground Antennas. The user segment consists of the avionics and interfaces necessary to receive and process GPS satellite signals into position, velocity, and time data for various military users.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: (U) The Congressionally approved 28 satellite block buy was initiated with a long lead contract award in Sep 82 and fully implemented with a Firm Fixed Price production contract in early CY 83 within the funding profile provided to Congress.

(2) (U) FY 1983 Program: The 28 satellite multiyear Block Buy contract will continue. This contract procures materials, parts, components, subsystems, labor and data in economic order quantities and full funds GPS satellites as follows: FY 84 (1), FY 85 (6), FY 86 (9), FY 87 (8), FY 88 (4).

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Initiates development required to implement the Congressionally directed GPS User Charges Program. Also initiates Pre-Planned Product Improvements to increase GPS survivability against more severe threats projected for the mid nineties. Planned improvements include additional hardening against nuclear effects, a high anti-jam telemetry, tracking, and control link, cross-link ranging, and improved performance in a nuclear scintillated environment. These improvements will maintain GPS as one of the most survivable satellite systems into the 21st century. Military construction funds will be used to develop sites for Ground Antennas on Diego Garcia and Kwajalein. Also proposed are modifications to an existing building at Cape Canaveral to provide a GPS satellite processing facility. Cost estimates are based on negotiated costs (for the satellites) and parametric estimates for the survivability Pre-Planned Product Improvements. A DoD-level review of the GPS cost estimates was completed in November 1982.

(4) (U) Program to Completion: In FY 1985, the GPS portion of the GPS/Satellite Control Facility (SCF) Interoperability Program will be initiated. This program will allow SCF assets (ground antennas, control station, etc.) to back-up GPS and GPS ground assets to back-up the SCF.

Program Element: #35165F

DOD Mission Area: #361 - Navigation and Position Fixing

Title: NAVSTAR Global Positioning System (GPS)

Budget Activity: #5 - Intelligence and Communications

C. (U) Major Milestones:

Milestones	
Defense Systems Acquisition Review Council II	2 Q CY 79
Begin Satellite Production	3 Q CY 82
Begin User Avionics IOT&E	3 Q CY 83
Defense Systems Acquisition Review Council III	2 Q CY 84
Begin User Avionics Production	3 Q CY 84
Shuttle Launch First Satellite	4 Q CY 85
Achieve Worldwide 2-D Capability	2 Q CY 87
Achieve Worldwide 3-D Capability	4 Q CY 88

3-D Satellite capability slipped one quarter due to time required to reprogram procurement funds and intitiate production.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

PROGRAM ELEMENT: 84733F TITLE: SENTINEL ASPEN (Gen Intel Training Mod)
DOD MISSION AREA: 324, General Intelligence Skill Training BUDGET ACTIVITY: 5, Intelligence and Communications

1. (U) RESOURCES ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
2909	TOTAL FOR PROGRAM ELEMENT	0	0	2,874	5,107	40,419	48,400

2. (U) SENTINEL ASPEN will provide USAF with a modernized general intelligence training capability to satisfy USAF, requirements in intelligence analysis, indications and warning and integration and DoD-wide training requirements in imagery exploitation, target intelligence and intelligence data handling. Engineering and development under this program will provide Air Training Command with hardware, software and methodology that will make the USAF training capability technologically compatible with field training requirements. SENTINEL ASPEN will consist of five tasks: an interactive imagery exploitation training system, intelligence data handling integration, interactive analysis training module, indications and warning module and interactiion module.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: N/A

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional To Completion	Total Estimated Cost
Other Procurement	0	0	0	0	2,800	2,800
Operations and Maintenance	0	0	0	0	4,800	4,800

5. (U) **Related Activities:**

6. (U) WORK PERFORMED BY: Each task will be competively bid. Task 1 will be a dual design contract. Task 2-5 acquisition mode will be determined later. ESD/TCI (AFSC) has been designated the System Project Office. Rome Air Development Center will participate.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: ESD/TCI will initiate development of Task 1 during FY 1984.

PROGRAM ELEMENT: 84733F TITLE: SENTINEL ASPEN (Gen Intel Training Mod)
DOD MISSION AREA: 324, General Intelligence Skill Training BUDGET ACTIVITY: 5, Intelligence and Communication

A. (U) Project Description: SENTINEL ASPEN will provide a modernized training capability for general intelligence disciplines (imagery interpretation, air intelligence and target intelligence. In addition, program will integrate current and projected intelligence data handling system training with intelligence discipline programs. Current training program uses methods and equipment that was deployed in the 1950s and 60s. With the deployment of new systems and techniques to the field, both have become obsolete. This situation has resulted in a technological imbalance between training requirements stated by operational users and the capabilities of the USAF intelligence training program. Development and deployment of a large number of systems to improve and streamline intelligence operations in the field further complicate the task for intelligence training organizations. There are insufficient facilities, manpower, training time and equipment to provide training on each specific system or mission. Therefore, there is a requirement to develop up-to-date generic training systems. The Research and Development and Acquisition of these technical training systems responds to Secretary of Defense guidance. The project is composed of five different tasks: Task 1 - Imagery interpretation; Task 2 - Intelligence data handling systems; Task 3 - Operations Intelligence Analysis and Applications; Task 4 - Indications and warning; Task 5 - Interaction. The approach will be to emphasize the commonalities among the systems and missions rather than the dissimilarities. R&D funds are required for integrating existing/ developing operational and commercial hardware and software into the basic systems. Procurement will fund expansion of systems to required number of positions.

B. (U) Program Accomplishments and Future Efforts:

(1). FY 83 Accomplishments: No previous activity under this program. Project begins FY84. Program does build on actions taken during FY82 and FY83. During those years RADC managed two contracts that defined requirements for imagery exploitation training. Those studies will form the requirements definition for Task 1, General Imagery Intelligence Training System.

(2). FY84 Planned Program and Basis for FY 1984 RDT&E Request: ESD/TCI and RADC/IRRE will let a Request for Proposal during FY 1894. The RFP will ask for contractor bids on designing and providing Task 1 system, General Imagery Intelligence Training System. This system will incorporate hardware, software and training methodologies for all imagery interpretation training that will enable the training program to meet unsatisfied field requirements. Acquisition strategy calls for a dual dsign competition to B-Specificaiton with single development to engineering model.

PROGRAM ELEMENT: 84733F TITLE: SENTINEL ASPEN
DoD MISSION AREA: 324, General Intelligence Skill Training BUDGET ACTIVITY: 5 Intelligence and Communications

(3). Program to Completion: Task 1 development will occur during FY85 and 86. Since the structure of Tasks 2-5 depend on the final form of Task 1. Details for these tasks have yet to be determined.

C. (U) Major Milestones:

Milestones	Dates
1. Task 1 RFP Release	2QFY84
2. Task 1 Contract Award	3QFY84
3. Task 1 IOC	4QFY86

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: 63248F Title: Concept Development
DOD Mission Area: 553 - Engineering Technology (ATD) Budget Activity: 6 - Defense-Wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	NA	NA	960	3,225	Continuing	NA

2. (U) BRIEF DESCRIPTION O ELEMENT AND MISSION NEED: The normal planning, programming, and budgeting system (PPBS) provides an effective method .o transition technology through exploratory development into system acquisition. However, in a limited set of cases, (i.e., technological breakthrough, alternate use of existing technologies, etc.), the PPBS does not have the flexibility to capitalize on these opportunities when they occur. To address this problem, the Air Force Systems Command Commander has established an office of New Concepts and Initiatives (NCI) to act as a clearing house for these types of new ideas. Working with using Commands and HQ USAF, the NCI office will assess the military worth of this select group of concepts and recommend one of the following dispositions: (1) rejection; (2) referral; (3) reorientation of existing programs; or (4) acceptance as an NCI for a feasibility demonstration. In the latter two cases, a modest amount of "out-of-hide" and/or appropriated funds are necessary to support these program formulation efforts and demonstrations. The Concept Development program element will underwrite these efforts particularly in cases when the new concepts cannot be specifically related/funded within ongoing efforts.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

NA	984	3,275

FY 83: This PE was zeroed without prejudice as part of the FY 83 Authorization Conference general reduction to RDT&E. This action has limited the NCI efforts only to those activities which can be done within approved programs.

FY 84: The $2,315K reduction for FY 84 represents rephasing of this effort based on the FY 83 action. It will cut at least two demonstrations out of the FY 84 NCI program. Note: Since NCIs are usually augmented by contractor IR&D funds, the actual reduction to the NCI program is two or three times as great as the specific cut.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

Not Applicable

Program Element: 63248F	Title: Concept Development
DOD Mission Area: 553 - Engineering Technology (ATD)	Budget Activity: 6 - Defense-Wide Mission Support

5. (U) RELATED ACTIVITIES:

Since the NCI program is structured to capitalize on innovative concepts as they occur, it is strongly related to the entire gamut of technology activities including: technology base efforts of the AF, other Services, DARPA, other Federal Agencies and contractor IR&D programs. To date, specific NCI efforts have been related to the "host" PE under which the work is being done. Appropriation of the requested FY 84 funds would remove this limitation and increase the potential scope of the NCI program.

6. (U) WORK PERFORMED BY:

Concept Action Teams (CAT) are formed at Air Force Systems Command field activities to review and manage NCIs in response to direction from the NCI office. Validation demonstrations will primarily be contracted out and account for the bulk of the funds in the Concept Development program element. Reorienting/focusing efforts will generally be accomplished using in-house resources.

7. (U) PROJECTS LESS THAN $10M IN FY 84:

The NCI program will consist of follow-on NCI efforts from those funded in previous years by directly related programs, as well as new initiatives funded under the Concept Development program element. Most of these efforts will be incrementally funded up to three years usually at a total cost of less than $3M. Specific initiatives currently in progress or programmed include:

A dual mode guidance demonstration for airborne armaments (HAVE WEDGE). This project is a proof of the concept and military worth demonstration of a dual mode guidance seeker with automatic handover capability. The demonstration will feature automatic handover from a RF seeker to an electro-optical seeker at either RF emitter shutdown or at a point when the EO seeker has a significantly strong sight picture of the target. The program is a two year $3M effort that was initiated within the direction of ongoing efforts in July 1982 with a cost-plus-fixed-fee contract with Hughes Aircraft Company. The first test flight will take place in the summer of 1983 with three live firings planned in total: the first being anti-radiation-homing with the emitter transmitting until target impact. No handover will be attempted. The second will include emitter shutdown and the third firing will have a continuous emitter with handover attempted at long distances from the target. Success of the HAVE WEDGE demonstration to validate the feasibility of multi-mode guidance can provide the basis for engineering development of the next generation of air launched weaponry.

Program Element: 63248F   Title: Concept Development
DOD Mission Area: 553 - Engineering Technology (ATD)   Budget Activity: 6 - Defense-Wide Mission Support

Rapid Fire Electromagnetic Gun. This project will demonstrate the feasibility of electromagnetic (EM) gun technology developed by the Air Force, Army, and DARPA. The first phase of the demonstration will be a three-year program to develop a ground-based, multi-shot EM gun. The ground-based demonstration is essential to address component technology problems of: power generation, switching, barrel fabrication, and projectile construction. Successful development of EM gun systems has the potential for firing projectiles at many times the velocity of chemical gun systems. This increased capability has applications to enhance/make possible a wide variety of required operational capabilities.

Other NCIs which arise during the year will be funded, as appropriate, from within resources appropriated for directly related programs or the Concept Development program element. The flexibility to respond/fund NCIs when they occur, as opposed to when they can be budgeted for, is the essence of the NCI program.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63402F
DOD Mission Area: Space Launch & Orbital Support, #410

Title: Space Test Program
Budget Activity: Defense-wide Mission Support, #6

1. (U) RESOURCES (PROJECT LISTING): ($ in Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	42,939	62,573	71,066	77,559	Continuing	Not Applicable
2617	Free-flyer Spacecraft Missions	20,200	27,673	34,060	35,449	Continuing	Not Applicable
2620	Shuttle Sortie Missions	22,739	34,900	37,006	42,110	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Space Test Program (STP) advances DOD technology by providing spaceflight missions for experiments that demonstrate new space system technologies, concepts and designs and that determine space environmental effects on DOD space systems. This tri-Service program provides the only substantial spaceflight capability to perform fly-before-buy demonstrations of advanced technology designs. The STP is to be the pathfinder for exploiting the Shuttle as a manned DOD space laboratory which should expedite the infusion of new technology into space systems through the use of simpler, incrementally-designed, man-aided experiments. The experience gained from this approach will be a key element in fully defining man's military role in space.

3. (U) COMPARISON WITH FY83 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	42,639	62,573	73,738

The difference of +300K in FY82 was due to the addition of funds to include a National Security task in NASA's Space Station Needs, Attributes and Architectural Options Studies. This money was transferred to NASA for disbursement to the eight contractors participating in these studies. The FY 1984 difference is due to inflation adjustments.

PROCUREMENT Not Applicable

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable

5. (U) RELATED ACTIVITIES: Expendable launch vehicles and their corresponding launch support are provided by Space Boosters, Program Element PE 35119F. Space Shuttle launch support and Inertial Upper Stage (IUS) systems are provided by Space Launch Support, PE 35171F. Host satellites for STP payloads include the Defense Meteorological Satellite (DMSP), PE 35160F; NASA Long Duration Exposure Facility (LDEF) and classified programs. Payloads are supported by the following: Office of Naval Research; Naval Research Laboratory; Army Atmospheric Sciences Laboratory; Defense Advanced Research Projects Agency, PE 62301E, PE 62711E, and PE 62701E; National Aeronautics and Space Adminstration; Defense Research Sciences PE 61120F; Geophysics, PE 62101F; Materials, PE 62102F; Aerospace Propulsion, PE 62203F; Advanced Weapons, PE 62601F; Missile Surveillance Technology, PE 63424F; Space Surveillance Technology, PE 62428F; Satellite Systems Survivability, PE 63438F; Space Vehicle Subsystems, PE 63401F; Systems Survivability, PE 64711F; and Advanced Space Communications, PE 63431F.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63402F Title: Space Test Program
DOD Mission Area: Space Launch & Orbital Support, #410 Budget Activity: Defense-wide Mission Support, #6

6. (U) WORK PERFORMED BY: The Air Force Space Division, Los Angeles, CA, is responsible for spaceflight planning, engineering, procurement, and operational aspects required to execute the Space Test Program (STP). Systems engineering support is provided by the Aerospace Corporation, Los Angeles, CA. Current payload integration and/or spacecraft contractors are Rockwell International, Seal Beach, CA, and Lockheed Missiles and Space Company, Sunnyvale, CA.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: 2617 Free-flyer Spacecraft Missions

A. (U) Project Description: This Space Test Program (STP) project supports advances in DOD space technology by providing for the spaceflight of experiments on STP developed free-flyer spacecraft for the demonstration of new system technologies, concepts and designs and for determining space environmental effects on military space systems. In addition, this project supports the spaceflight of small secondary payloads on free-flyer host spacecraft. The project provides spacecraft procurements, payload integration, launch support, and orbital support. Space Shuttle launch support tasks are provided by PE 35171F, Space Launch Support. This project currently supports the development of STP spacecraft to support the Defense Advanced Research Projects Agency (DARPA) Teal Ruby mission, the Defense Nuclear Agency HILAT mission and the integration of numerous secondary experiment missions on host spacecraft.

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: In FY 1982 the Space Test Program finalized the development and acquisition of hardware to accomplish the STP/Defense Nuclear Agency P82-1 HILAT mission. The STP played a major role in the no-cost acquisition of a surplus Navy Transit satellite for use as spacecraft bus to support the DNA experiments on orbit. To accomplish the launch of the P83-1 HILAT satellite, STP obtained a surplus Scout launch vehicle from NASA -- also at no cost. Use of these surplus items is resulting in a savings of approximately $13M and an earlier launch of these important payloads which will investigate the effect of nuclear and naturally disturbed ionosphere on communications systems. In May 1982, STP secondary mission S81-1 was successfully flown on a classified host satellite. This mission flew two Office of Naval Research experiments that are investigating new techniques to provide jam-resistant VLF/ELF communications. Significant deliveries of major subsystems for the STP P80-1/Teal Ruby spacecraft were completed. This spacecraft will support the DARPA Teal Ruby sensor and two secondary experiments. Subsystem and system level technical and testing problems have delayed the Teal Ruby/P80-1 launch on the Shuttle from [ ]

(2) (U) FY 1983 Program: Efforts will continue on the delivery and testing of subsystems to support P80-1 spacecraft development and Teal Ruby sensor integration. Payload integration and launch services support will be provided for the STP/Defense Nuclear Agency P83-1 HILAT mission, and on-orbit support will be provided after its launch from Vandenberg Air Force Base in June 83. STP will provide support for the integration of a complement of four secondary payloads (S80-1) in NASA's Long Duration Exposure Facility (LDEF) satellite. These experiments will allow determination

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63402F — Title: Space Test Program
DOD Mission Area: Space Launch & Orbital Support, #410 — Budget Activity: Defense-wide Mission Support, #6

of space environmental effects on spacecraft materials, and active/passive radiation hardened fiber optics components. Integration of secondary payload S81-2 on a host Defense Meteorological Satellite Program (DMSP) satellite will be completed to support the scheduled DMSP launch date. This experiment will collect data to improve our ability to predict auroral conditions and their effect on a communication systems. Efforts will continue to define future missions to support the spaceflight of other approved DOD experiments.

(3) FY 1984 Planned Program and Basis for FY 1984 Request: The major effort in this project in FY 1984 will be the continued delivery of P80-1/Teal Ruby spacecraft subsystems and components for spacecraft integration, subsystem and system level testing, and resolution of problems arising from the testing. All of these efforts are geared to support the new P80-1/Teal Ruby mission launch date from the Space Shuttle in [ ] The Teal Ruby mission, known by its primary Defense Advance Research Projects Agency (DARPA) payload of the same name, also carries Army and National Aeronautics and Space Administration (NASA) secondary payloads. The DARPA experiment will demonstrate new [ ] infrared technologies and collect data needed for the design of future space-based aircraft and missile detection systems [ ] The P80-1 spacecraft will also support at least two secondary payloads — the testing of a NASA sponsored ion thruster experiment and its capabilities for long-term, satellite station-keeping and an Army ultraviolet spectrometer experiment studying the space ultraviolet (UV) spectrum. Integration and testing will be completed for the complement of experiments S80-1 to be launched from the Kennedy Space Center on the NASA LDEF reusable, free-flying satellite. The exact launch date for this satellite from the Space Shuttle and its retrieval date (approximately 12 months later) are dependent on NASA Shuttle manifesting. The projected launch date is 2Q FY84. Upon launch, STP will provide on-orbit support to the experimenters. STP will continue to provide on-orbit support to the DNA HILAT mission and the DMSP host mission S81-2. Efforts will continue to define future missions to support the spaceflight of other approved DOD experiments.

The cost estimating techniques used by the STP include the use of existing AF Space Division cost models, AF Systems Command cost models, independent Aerospace Corporation models, contractor estimates and a large data base of experience from developing previous STP free-flyer spacecraft missions.

C. Major Milestones

Major Milestones	Dates
(1) Scout launch of DNA HILAT P83-1 spacecraft	June 1983
(2) Atlas launch of DMSP (F-7) - host satellite for S81-2	[ ]
(3) Shuttle launch of NASA LDEF - host satellite for S80-1	2Q FY 84
(4) Shuttle launch of Teal Ruby P80-1 spacecraft	[ ]

9. (U) PROJECTS OVER $10 MILLION IN FY 1984

(U) Project: 2620 Shuttle Sortie Missions

A. (U) Project Description: This Space Test Program (STP) project advances DOD space technology by providing for the spaceflight of experiments on Shuttle sortie missions (payload/experiments remain in Shuttle and are returned) for

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63402F
DOD Mission Area: Space Launch & Orbital Support, #410
Title: Space Test Program
Budget Activity: Defense-wide Mission Support, #6

demonstrating new system technologies, concepts and designs and for determining space environmental effects on military space systems. Through sortie missions using the reusable, standard STP Shuttle experiment support equipment STP will accomplish its pathfinder requirement for exploiting the Shuttle as a manned DOD space laboratory. Capability to control payloads in the payload bay from the aft flight deck as well as the capability to actually store and perform payload experiments in the aft flight deck will be developed. The experience gained on these sortie missions will be a key element in defining man's military role in space. The project also supports the flight of secondary experiments in NASA Get-Away Special containers and on other support structures being flown in the Shuttle sortie mode. Project provides for procurement of reusable Shuttle experiment support equipment, integration of payloads on the Shuttle experiment support equipment and the integration of the combination into the Shuttle, mission/payload specialist training on STP hardware, launch support, and on-orbit support. Shuttle launch support is provided by PE 35171F, Space Launch Support This project currently supports the Experiment Support System (ESS)/Cryogenic Infrared Radiance Instrumentation for Shuttle (CIRRIS) 1A mission and two Talon Gold space based laser acquisition, tracking and pointing missions.

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: [

] Preliminary planning and mission studies to support the integration of the DARPA Talon Gold experiments for Shuttle sortie missions continued.

(2) FY 1983 Program: [ ] of the ESS to support the flight of the CIRRIS IA experiment and three other approved DOD experiments [ ] will begin. This STP mission will seek to conduct the entire mission (control the experiments from the aft flight deck of the Shuttle) utilizing a trained Manned Spaceflight Engineer (MSE) and payload/payload bay interface equipment. The primary experiment CIRRIS IA, will gather data key to the [

] Payload integration of two small payloads (S83-1 and S83-3) with a NASA

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63402F
DOD Mission Area: Space Launch & Orbital Support, #410

Title: Space Test Program
Budget Activity: Defense-wide Mission Support, #6

Get-Away-Special (GAS) canister will be completed. STP is funding modification and space qualification of these GAS cans to incorporate an opening lid and a viewing window. Both of these payloads will be flown on sortie missions in FY 1983. STP will continue to work with DARPA to establish a technical baseline for the Shuttle integration of two Talon Gold missions. The purpose of these missions is to demonstrate the feasibility of acquisition, tracking and pointing systems for application to a space-based laser weapon system. STP will continue, within available funding, to acquire standard, reusable Shuttle experiment support equipment to further the exploitation of the Shuttle as a manned DOD laboratory.

(3) FY 1984 Program and Basis for FY 1984 RDT&E Request: [ ] of the ESS to support the flight of CIRRIS IA and three other experiments will continue. Actual integration of the payloads to the ESS structure will begin. Development of the interface hardware between the aft flight deck and the payload bay will continue and integration testing of the Shuttle and payload interfaces will commence. Mission operations and astronaut MSE training plans will be developed to support experiment mission requirements. The ESS/CIRRIS IA mission is scheduled for a [ ] STP will complete the integration of a small payload (S84-1) into a NASA GAS can and provide support for its launch in FY 1984. Based on a jointly developed (STP and DARPA) technical program baseline, STP will begin the efforts necessary to fly the DARPA Talon Gold I and II missions on the Space Shuttle in [ ] respectively. STP will support the development and acquisition of equipment necessary to integrate the DARPA experiments into the Space Shuttle payload bay and equipment necessary to interface with the payloads for the purpose of on-orbit operation. STP will also provide the necessary analytical efforts to support the integration activities. These seven-day sortie missions are key to the development of an acquisition, tracking and pointing system for a space-based laser weapon system. STP will continue the development/acquisition of equipment to support direct manned involvement with experimental payloads located in the Shuttle aft flight deck and in the payload bay. Development of these capabilities will expedite the infusion of new technology into space systems through the use of more simple, less costly, incrementally designed, man-aided experiments. Experiment results and experience in using this approach will be key elements in fully defining man's military role in space.

The cost estimating techniques used by the STP include the use of existing AF Space Division cost models, AF Systems Command cost models, independent Aerospace Corporation models, and contractor estimates. Since no significant data base exists for Shuttle sortie type missions (except ESS/CIRRIS I), STP is developing cost estimating capabilities as they gain experience in integration and operations activities with Shuttle.

C. Major Milestones:

Milestones	Dates
(1) Shuttle sortie mission of GAS payload S83-1	3Q FY 83
(2) Shuttle sortie mission of GAS payload S83-3	4Q FY 83
(3) Shuttle sortie mission of GAS payload S84-1	2Q FY 84
(4) Shuttle sortie mission of ESS/CIRRIS IA (R-12)	[
(5) Shuttle sortie mission of Talon Gold I	
(6) Shuttle sortie mission of Talon Gold II	]

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FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63438F | Title: Satellite Systems Survivability
DoD Mission Area: Space Launch and Orbital Support, #410 | Budget Activity: Defense Wide Mission Support, #6

1. (U) RESOURCES (PROJECT LISTING)($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	10,975	19,525	34,011	59,920	Continuing	Not Applicable
2611	Survivability Analysis	996	1,020	1,599	1,622	"	"
2612	Satellite Survivability	5,206	3,900	14,438	23,758	"	"
2613	Ground Station/Link Survivability	4,773	14,605	17,974	34,540	"	"

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Space systems are required to provide critical strategic and tactical support to national decision makers and military force commanders at all levels of conflict. They specifically provide missile attack warning, strategic and tactical navigation, surveillance, [ ] forces command and control communications, and meteorological information. These systems provide support to strategic, tactical, and Rapid Deployment Forces on a global basis. [

] Failure to protect our space systems will most probably result in the denial of their critical support to the National Command Authority and our military forces during crisis and conflict.

This program develops the necessary prototype hardware, software, technology, and operational procedures that will provide generic survivability capabilities for the military space systems of the United States. The program is structured to provide balanced survivability between all space systems elements: satellites, data/command links, and ground stations.

Major development efforts within this program include the following: 1) Satellite Defense Systems-a combination of active and passive devices, to be installed on host satellites, which could counter the current and projected Soviet antisatellites; and 2) Transportable/Mobile Ground Station-a mobile control station providing the telemetry, tracking, and commanding necessary to maintain critical operational capability of key satellites throughout all levels of conflict.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
RDT&E	11,058	22,525	38,304	-	Continuing	Not Applicable

The FY 1983 RDT&E change supports reprogramming for NORTH WARNING (Improved DEW Line). The reduction in FY 1984 funding relative to the amount shown in the FY 1983 Descriptive Summary reflects a reallocation of funds to other Air Force efforts.

Program Element: #63438F
DoD Mission Area: Space Launch and Orbital Support, #410

Title: Satellite Systems Survivability
Budget Activity: Defense Wide Mission Support, #6

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

5. (U) RELATED ACTIVITIES: PE 62601F, Advanced Weapons, and PE 64711, Systems Survivability, develop nuclear hardening technology which is applied in PE 63438F. Program Element 63431, Advanced Space Communications Capabilities, develops technology, subsystems, and systems to improve link survivability. Technology from this program will be used to improve the antijam performance of survivable tracking, telemetry, and control stations. PE 63211F, Aerospace Structures and Materials, develops laser-hardened satellite components and materials.

6. (U) WORK PERFORMED BY: The Air Force Systems Command's Space Division, Los Angeles, CA, manages this program. Ford Aerospace and Communications Corporation, Sunnyvale, CA, is developing Ground Station and Link Survivability systems including a validation model Transportable/Mobile Ground Station. Hughes Aircraft Company, Fullerton, CA, is developing the Adaptive Sidelobe Cancellation System.

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

(U) Project: 2611 Survivability Analysis - Reviews the mission requirements for Department of Defense space systems, evaluates their vulnerability to current and future threats, and determines the most cost-effective methods to achieve required survivability. During FY 1982 the Space Mission Survivability Implementation Plan was updated. A baseline standard for minimum tracking, telemetry, and commanding requirements was developed, based upon a sample of four Department of Defense space systems. During FY 1983, this project will support the Space System Architecture which is an effort to develop an investment strategy to provide cost-effective survivability enhancements for current and planned space systems. In FY 1984 this project will continue to support the Space System Architecture.

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: 2612 Satellite Survivability

A. Project Description: The Soviets continue to test their operational non-nuclear satellite interceptor which is capable [

] To protect United States military satellites against the Soviet antisatellite, a comprehensive program has been formulated to develop systems to provide attack warning, identify the nature and location of the attacker, and counter the attack. The objective of this effort, the Satellite Defense System program, is to design, develop, and test an on-board satellite self-protection system [ ] Countering the laser threat requires a two-pronged approach: 1) developing hardened materials and; 2) developing countermeasures to avoid being lased.

B. (U) Program Accomplishments and Future Efforts:

(1) FY 1982 Accomplishments: Testing of materials hardened to withstand laser radiation damage was completed in May. The results of the tests, performed with the Materials Laboratory, met or exceeded objectives of [

Program Element: #63438F Title: Satellite Systems Survivability
DoD Mission Area: Space Launch and Orbital Support, #410 Budget Activity: Defense Wide Mission Support, #6

[ ] The concept definition for a laser countermeasures demonstration was completed. The next phases of the two preceding tasks will be resumed in FY 1988 when additional funds are available. An in-house concept definition for the Satellite Defense System, which could provide a means of protecting United States Satellites against the Soviet ASAT threat, was completed.

(2) (U) FY 1983 Program: Multiple contracts will be awarded for the concept development phase of the Satellite Defense System. This phase will last approximately 12 months, and involve two or three contractor teams.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The concept development phase for the Satellite Defense System will be completed and contractor efforts evaluated. A single contract will then be awarded for the concept demonstration phase. This effort, lasting approximately 36 months, will provide for design, construction, and testing of critical components needed for a system to counter the Soviet ASAT threat. Cost estimates are based upon in-house calculations for similar efforts and discussions with contractors.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not Applicable.

9. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: 2613 Ground Station/Link Survivability

A. Project Description: The Soviet Union has developed, and is continuing to develop, a formidable range of threats [ ] They have a capability [ ] conduct sabotage against our ground facilities, or deny us use of our oversea ground stations through political action. This project develops systems, subsystems, technology, and operational procedures to counter the Soviet threats against satellite command, control, and communication links, and provide backup capabilities to mitigate the loss of fixed ground stations damaged or destroyed during natural disasters. The major on-going project is the Transportable/Mobile Ground Station, a mobile control station providing survivable telemetry, tracking, and commanding for satellites throughout the spectrum of conflict.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: A successful Program Decision Review was held for the Transportable/Mobile Ground Station in September. The Transportable/Mobile Ground Station will provide semiautonomous tracking, telemetry, and control data necessary to maintain the "health" of our satellites during emergency situations when the Satellite Control Facility and/or Remote Tracking Stations are inoperable. Work continued on the Adaptive Sidelobe Cancellation System which provides antijam protection to satellite down links.

(2) FY 1983 Program: A Critical Design Review is scheduled for the Transportable/Mobile Ground Station in September 1983. Fabrication of the Adaptive Sidelobe Cancellation System will be completed. This system will then be integrated [ ] Tests are scheduled to begin in [ ]

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Assembly of the Transportable/Mobile Ground Station will continue with testing scheduled to begin in FY 1985. Concept definition will commence on a follow-on system for providing more highly survivable tracking, telemetry, and control capability. This concept envisions combining a small, but powerful computer and its software, with MILSTAR terminals. The result will be a proliferated system having significantly increased antijam features.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63707F Title: Weather Systems (Advanced Development)
DOD Mission Area: #420 - Global Military Environmental Support Budget Activity: #6 - Defense-Wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	3,189	3,438	3,244	2,962	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Air Force critically needs the ability to observe and collect essential weather information in battle areas not under friendly control. Employment of precision guided munitions requires specific environmental information unique to the weapon's sensing systems which is not available through present weather observing and forecasting techniques. This program develops methods to gather required weather information and process it for use by battle staff planners/aircrews to insure effective employment of conventional or precision guided munitions under battlefield conditions. MAC SON 508-78, Prestrike Surveillance/Recon System (PRESSURS), defines the operational needs addressed by this program. In this project, work is also being done to develop a doppler weather radar capability. Timely warning for specific severe weather events is required to protect Air Force assets. Doppler weather radar provides the ability to detect severe weather phenomena. In order to process this information in a timely manner to provide warning, automated analysis techniques are required. This program provides the required automatic radar data analysis techniques for the joint Department of Defense (DoD)/Department of Transportation (DOT)/Department of Commerce (DOC) Next Generation Weather Radar (NEXRAD) development.

3. COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
RDT&E ($ in Thousands)	2,889	3,438	3,367		Continuing	N/A

FY 1982 funds were transferred to Next Generation Weather Radar development program from PE 64707F for automated severe weather warning analysis development. 1984 - Inflation indices reductions.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #63707F Title: Weather Systems (Advanced Development)
DOD Mission Area: #420 - Global Military Environmental Support Budget Activity: #6 - Defense-Wide Mission Support

5. (U) RELATED ACTIVITES: Results of advanced development efforts in this Program Element are implemented through Program Element 64707F, Weather Systems (Engineering Development) and Program Element 35111F, Weather Service (Other Procurement). Specifically, results of the Battlefield Weather Support Program will undergo engineering development in PE 64707F. Next Generation Weather Radar Development (PE 64707F) will directly use automated severe weather forecast techniques developed. The FY 1982 Science and Technology Program Apportionment Review to Under Secretary of Defense for Research and Engineering provided a forum for tri-service coordination of efforts in battlefield forecasting techniques. The Department of Defense Atmospheric Transmission Plan is the focal point for support of precision guided munitions delivery. Working level contact with the Army and Navy continues, avoiding unnecessary parallel development of techniques and systems. A tri-service workshop was held in August 1981 to coordinate defense electro-optical/millimeter wave environmental support for tactical operations.

6. (U) WORK PERFORMED BY: Program management is provided by Air Force Geophysiscs Laboratory, Hanscom AFB MA, with program participation by Air Force Wright Aeronautical Laboratory, Wright-Patterson AFB OH and Air Force Armament Test Laboratory, Eglin AFB FL. Technical work for this Program Element is accomplished by contractors such as Systems and Applied Science Corporation, Riverdale MD, Battelle Columbus Laboratories, Columbus Laboratories, Columbus OH, Georgia Institute of Technology, Atlanta GA, and University of California Visibility Laboratory, San Diego CA.

7. (U) WEATHER SYSTEMS (ADVANCED DEVELOPMENT) (SINGLE PROJECT LESS THAN $10 MILLION IN FY 84): BATTLEFIELD WEATHER SYSTEMS - Develops the ability to acquire and process weather information for use by battle commanders and pilots to employ precision guided munitions effectively. The Air Force has no capability to gather or process environmental information from data denied areas which is critical to the effectiveness of today's high technology weapons. A tactical decision aid for infrared guided weapons was completed and transferred to operational commands for implementation in FY 1982. Analysis of options for gathering weather information from hostile or areas not under friendly control will be complete in FY 1983. A decision will be made to pursue the most effective candidate system to acquire battlefield environmental information from data denied areas. Prototype sensor packages will be developed in FY 1984. Tactical decision aids for laser designators and TV-based systems will be delivered in FY 1984. The final version of the infrared tactical decision aid will be delivered, and work to complete a millimeter wave-based system tactical decision aid will continue. NEXT GENERATION WEATHER RADAR - Using the doppler weather radar under development, advanced automated analysis techniques will insure timely warning of severe weather for protection of Air Force resources. Computer Automated techniques to forecast hail and thunderstorm mesocyclones have been completed and will be delivered to the doppler weather radar development program in FY 1982. Development of automated techniques for identification and forecast of other required severe weather phenomena such as wind shear, turbulence, rain rate and forecast movement and intensity, will continue through FY 1984.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64211F
DOD Mission Area: #452 - Aerial Targets

Title: Advanced Aerial Target Development
Budget Activity: #6 - Defense-wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	14,150	12,756	10,678	3,290	Continuing	N/A
469A	Firebolt	12,000	9,495	5,049	-0-	-0-	54,055
2535	QF-100 Full Scale Aerial Target	2,150	-0-	-0-	-0-	-0-	12,764
2459	Target Payload Systems	-0-	3,261	5,629	3,290	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Aerial target development is key to insuring the effectiveness and crew proficiency in the employment of our tactical forces against enemy threats. The overall objective is to improve air-to-air weapon system accuracies and reliability by developing aerial target systems for weapon system evaluation and aircrew training. The targets being developed will help provide a proper mix of full-scale, subscale, and gunnery tow targets. Firebolt is being designed to simulate high, fast threats which our new weapons will encounter. The QF-100 will replace the depleting PQM-102 inventory of full scale targets. Target Payloads Systems will increase effectiveness of targets by improving target subsystems for missile scoring and developing subsystems to provide target radar and infrared signatures which are representative of the threats.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
RDT&E	12,254	13,856	14,193		Continuing	N/A
Missile Procurement (PE35116F)	16,200	22,964	36,179		Continuing	N/A

RDT&E: The $1,900,000 increase in FY 82 restored funding required by the Firebolt program. In FY 84 a reduction of $3,056,000 in Target Payloads was directed to fund other higher priority Air Force programs. This reduction delayed development effort on infrared and radar augmentation and countermeasures systems for targets.
Missile Procurement: The $199,000 reduction in FY 82 represents reprogramming within PE35116F moving funds from the QF-100 project to provide funding required for target Drone Tracking and Control System procurement. In FY 84 a reduction of $10,965,000 in QF-100 procurement was directed to fund other higher priority Air Force programs. QF-100 production was reduced from a quantity of 52 to 36.

Program Element: #64211F
DOD Mission Area: #452 - Aerial Targets

Title: Advanced Aerial Target Development
Budget Activity: #6 - Defense-wide Mission Support

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Missile Procurement (PE35116F)						
469A Firebolt						
Funds				6,835	Continuing	N/A
Quantity				6	Continuing	N/A
2535 QF-100						
Funds	16,001	22,964	24,716	25,830	126,280	215,791
Quantity	21	51	36	36	156	300

5. (U) RELATED ACTIVITIES: The Army and Navy are actively involved with the Air Force in the development of various target systems and subsystems. Cooperation and coordination is maintained under the auspices of the Joint Logistics Commanders Group through an active Joint Technical Coordinating Group for Aerial Targets. Additionally, formal coordination through the Department of Defense Armament/Munitions Requirements, Acquisition and Development Committee ensures non-duplication of efforts. The Air Force is the lead service for the Firebolt project, which is a tri-service program documented by program office Memoranda of Agreement. The Navy has funded Firebolt contract options for the manufacture of additional flight vehicles and for design for integration of Navy payloads. The Air Force QF-100 project will also provide targets for the Army. The Air Force is also joining in procurement of the MQM-107B subscale target developed by the Army. There is cooperation with both the Army and Navy on a number of scoring and augmentation subsystems efforts. Other related Air Force Program Elements -- Air Force targets are procured under PE 35116F. The current Firebolt Full Scale Engineering Development program was preceded by an Advanced Development program under PE 63232F, which is no longer active.

6. (U) WORK PERFORMED BY: The Firebolt prime contractor is Teledyne Ryan Aeronautical, San Diego, California. Principal Firebolt subcontractors are United Technologies Chemical Systems Division, Sunnyvale, California; Brunswick Corporation's plant at Costa Mesa, California; and Marquardt, Van Nuys, California. The QF-100 prime contractor is Sperry Flight Systems, Phoenix, Arizona. Contractors involved in developing augmentation and scoring subsystems include Cartwright Engineering, Inc., Anaheim, California; Santa Barbara Research Center, Goleta, California; Raytheon Missile, Oxnard, California; and Hayes International, Birmingham, Alabama. Tracking and control systems for ground control of subscale and full scale targets are developed by Vega Precision Laboratories, Inc., Vienna, Virginia. Air Force target development effort is managed by the Armament Division, Eglin Air Force Base, Florida.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project #469A, Firebolt: Firebolt is a full scale development program for a target to simulate threats in in the high, fast regime for evaluation of weapons systems, development of tactics, and aircrew training. Firebolt will succeed the use of converted CQM-10B (Bomarc) missiles as targets and provide the improved performance and controllability needed to simulate the characteristics of current and emerging threats. In FY 82, assembly of flight test vehicles began. Ground test of the scoring system performance on Firebolt was completed, and ground and flight drop tests of the recovery system were completed. Functional test and Preliminary Flight Readiness engine firing tests on complete vehicles were initiated. Development Test and Evaluation flights will begin in the third quarter of FY 83. Initial Operational Test and Evaluation will be conducted in FY 84. The 23 flight program will include both Navy and Air Force weapon firings against Firebolt. Manufacture and delivery of flight test vehicles will continue and planning for Air Force production will begin. For the Navy, contract options for 12 vehicles and associated subsystems were initiated in FY 82. Delivery of these vehicles will begin in FY 83 with delivery of Navy payload configured vehicles beginning in FY 84.

B. (U) Project #2459, Target Payload Systems: This project involves development engineering for aerial target subsystems. These subsystems are required to provide scoring information and to augment the radar and infrared signatures of targets to provide realistic representation of threats. The Target Payload Systems project was not funded in FY 82. Some supporting effort was accomplished in the area of improved missile scoring systems on the QF-100 project and in the area of improved infrared augmentation for subscale targets in conjunction with flight evaluation of the MQM-107B. In FY 83, flight tests of vector missile scoring systems, designed to identify the path of the missile past the target, will be initiated. Flight tests of an infrared augmentation system designed to provide simulation of engine plume signatures will be conducted. In cooperation with the Navy, a contract will be awarded for breadboard fabrication of a high fidelity radar signature simulation system. In FY 84, work on vector scoring systems will move through full scale development to production; the infrared plume generator will complete integration into the subscale targets and enter production; and the high fidelity radar augmentation system will be assessed for entry into full scale development.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64227F
DOD Mission Area: #430 - Non-System Training Devices

Title: Flight Simulator Development
Budget Activity: #6 - Defense-Wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 82 Actual	FY 83 Estimate	FY 84 Estimate	FY 85 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	11,108	5,439	25,039	103,078	Continuing	N/A
2325	Simulator Development Activities	1,308	2,000	3,650	6,757	Continuing	N/A
2769	Simulator Update Dev	9,800	3,439	7,033	16,642	Continuing	N/A
2851	Standard DMA Data Base Transformation Program			957	1,425	3,863	6,245
2901	B-1B Weapon System Trainer			9,669	66,801	47,236	123,706
2902	T-46 Operational Flight Trainer			200	8,170	29,334	37,704
2903	F-15/F-16 Simulator for Air-to-Air Combat			3,150	1,953	4,144	9,250
2968	Simulator Modularity Design			380	1,330	10,803	12,523

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This is a continuing program element for the engineering development of aircrew flight simulation techniques and training devices. The objectives of this element are to adapt flight simulation technology developed in the laboratories and industry for satisfying current training requirements and to develop prototype training devices. Prototype training devices and subsystems developed under this element will be evaluated for training effectiveness and supportability prior to follow-on production decisions and/or integration with training devices in acquisition.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 82	FY 83	FY 84	FY 85	Additional to Completion	Total Estimated Cost
RDT&E	11,258	5,439	8,456	---	Continuing	N/A

Increases in FY 1984 were due to the addition of computer replacement modifications for the F-4E/G, and C-135 simulator and the approval of the B-1B Weapon System Trainer (WST) and T-46 Operational Flight Trainer (OFT) programs.

Program Element: #64227F
DOD Mission Area: #430 - Non-System Training Devices

Title: Flight Simulator Development
Budget Activity: #6 - Defense-Wide Mission Support

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

		FY 82 Actual	FY 83 Estimate	FY 84 Estimate	FY 85 Estimate	Additional to Completion	Total Estimated Cost
	Aircraft Procurement Funds:						
2901	3010 (PE 11126F)				139.6	134.9	274.5
	Quantity				3	3	6
2769	3010 (PE 27128F)					19.6	19.6
	Quantity					5	5
2902	3010 (PE 84741F)					88.4	88.4
	Quantity					10	10
	Military Construction Funds:						
2901	3300 (PE 11126F)				8.8	7.9	16.7

5. (U) RELATED ACTIVITIES: Projects in this element rely on the technologies from inter and intra-service coordination of technology base programs. This element relies heavily on the Air Force Human Resources Laboratory technological base programs. Specific programs which support this element include the following: PE 62205F, Training and Simulation Technology; PE 63227F, Advanced Simulator Development; PE 63751F, Innovations in Education and Training.

6. (U) WORK PERFORMED BY: The Deputy for Simulators, Wright-Patterson Air Force Base, OH is the in-house organization responsible for the majority of this element. Remaining in-house efforts include several tasks within the Simulator Development Activity project. F-4E/G computer replacement, F-15/F-16 Simulator for Air-to-Air Combat (SAAC), and C-135 modifications to be performed by Singer-Link Corp. Binghampton, NY. Modification of the Simulator for Electronic Warfare Trainer (SEWT) was awarded to the AAI Corp., Baltimore, MD. Contractors for the B-1B and T-46 simulators have not been determined.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: 2325 Simulator Development Activities. The purpose of this project is to research the many diverse issues confronting designers to allow development of simulators for today's complex aircraft with lower costs, and improved training effectiveness. It continues joint Air Force/Navy efforts to complete the demonstration of a flight simulator visual system that will cost less than current systems through integration of existing components to test an eye-slaved high resolution, high detail area-of-interest image inset into a lower resolution background. This approach uses components developed by the Singer-Link Corp. and by the General Electric Corp. These efforts will make cost effective use of technology developed during the Tactical Combat Trainer (TCT) project (funds for development of the TCT were removed during the FY 1982 budget formulation). Examples of other efforts to make use of existing technology to reduce the procurement costs and risks associated with flight simulation include: investigation into simulation of advanced, high resolution, synthetic aperture radars that are being introduced into the inventory; continuation of investigation into the relationship between simulator handling qualities and pilot performance to effectively quantify and verify simulator performance requirements and to improve and shorten simulator testing (e.g., electronic warfare simulation testing); investigation of prototype development efforts for application on simulators for advanced aircraft; and development and evaluation of helmet mounted visual displays.

B. (U) Project: 2769 Simulator Update Development. This project funds prototype development of modifications and updates to simulators in the field. In FY 1982, FY 1983, and FY 1984, the C-135 B Flight Simulator will be refurbished with a new computational system and modified to incorporate the latest aircraft configuration of the communication/navigation system, cockpit instruments, and fuel savings advisory system. The contract was awarded to Singer-Link Corp., Binghampton NY, in September 1982. Also, in FY 1982 and FY 1983, the Simulator for Electronic Warfare will be refurbished with an updated computational system and addition of simulation of the ALQ-99 system. This contract was awarded to the AAI Corp., Baltimore, MD, in April 1982. In FY 1984, the F-4E/G Simulator refurbishment will begin with replacement of the outdated and unsupportable GP-4B computer system. Also included in this project are efforts to improve the simulator reliability and maintainability.

C. (U) Project: 2851 Standard DMA Data Base Transformation Program. This is a joint development project initiated through the Joint Logistics Commanders to develop a standard Defense Mapping Agency (DMA) data base transformation program, which is a program that converts standard digital DMA data and converts it for presentation to the pilot (e.g., visual, radar, infrared). This program would be provided as government furnished equipment (GFE) to simulator manufacturers and would eliminate much of the problems and expense associated with the proliferation of unique transformation programs and subsequent updates. This is a new start in FY 1984.

D. (U) Project: 2902 T-46 Operational Flight Trainer (OFT). This project will develop the Operational Flight Trainer to support the T-46 training system. The simulator will be developed as a complex, with each complex consisting of four T-46 cockpits, with both student and instructor positions, a two man operator station, and a limited three degree of freedom motion base to provide limited cueing for turbulence, stall warning/buffet, and touchdown. A total of eleven complexes will be procured. The visual system will be provided as government furnished equipment, which will be those visual systems in place on the T-37 simulators at the time of deployment of the T-46. This is a new start in FY 1984.

E. (U) Project: 2903 F-15/F-16 Simulator for Air-to-Air Combat (SAAC). The primary purpose of this project is to provide a training capability for our front line fighters, the F-15 and F-16. The SAAC is the only air-to-air combat trainer in the USAF. It has two full field of view visual systems configured with F-4 cockpits. The SAAC will be modified with both F-15 and F-16 cockpit configurations to provide air-to-air combat training, allow more extensive tactics development for these aircraft, and allow further research and development. The SAAC will be configured with a "Y" track to allow these cockpits to be interchanged. The F-15 cockpit will be incorporated by the second quarter FY 1985; the F-16 cockpit will be incorporated by the third quarter FY 1987.

F. (U) Project: 2968 Simulator Modularity Design. By approaching simulator design with a modular approach, considerable potential exists to decrease both acquisition and life cycle costs, reduce development lead times, improve the ability to deliver simulator to the field concurrent with the aircraft, and to increase the competitive base. This project is a tri-service effort and consists of three phases. The first is a request for information (released in

December 1982) to assess, from an industry perspective, the feasibility of modularity for operator simulators, the advantages, disadvantages, cost and potential impact on technology. Phase II is a competitive effort with two contractors to identify the tools required to implement modularity, refine cost and schedule estimates to develop, validate the proposed approach, and to develop a suggested specification and statement of work for the final phase. Analysis of these results will lead to contract award for Phase III in the fourth quarter of 1985. This phase will consist of development and validation on an existing device of the standards and tools necessary to achieve modularity.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: 2901 B-1B Weapon System Trainer (WST)

A. (U) Project Description: The Strategic Air Command requires development of a training system to meet the training needs of all B-1B crew members. Tasks required to be trained include mission rehearsal training for takeoff and landing, navigation, air refueling, threat analysis/countermeasures, low level penetration, weapons delivery, and emergency procedures. Emphasis will be placed on training tasks that cannot be accomplished in the aircraft and on integrated crew training. These tasks include those related to safety of flight, emergency procedures, emergency war order rehearsal, and others for which a suitable training environment does not exist. A total of five WSTs, which simulate all four crew positions, and two Mission Trainers (MT), which simulate only the offensive and defensive positions, will be procured. Further, a flight station, which consists of the pilot and copilot stations only, will be delivered early and later integrated and delivered as one of the five WSTs. Crews can be trained in either an integrated or independent mode. Trainers will be capable of providing war order mission rehearsal.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: The Training Program Development Management Plan was prepared to define all of the flying and maintenance training tasks required to support the B-1B training system. The acquisition strategy was developed and approved by the B-1B Configuration Steering Group.

(2) (U) FY 1983 Program: The Air Force intends to initiate the B-1B WST development in FY 1983, conduct source selection, and award the contract for the competitive development of Phase I.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The FY 1984 effort provides for the competitive development of the WST through the Preliminary Design Review (PDR) (Phase I). The winning contractor would then be selected to complete the WST development and production for Phase II. The B-1B WST development is based on a $300 million baseline program (FY 1981). The estimating technique included both parametric and bottom-up approaches.

(4) (U) Program to Completion: Phase II, which includes completion of design, development, test, evaluation and deployment begins in FY 1985.

Program Element: #64227F
DOD Mission Area: #430 - Non-System Training Devices

Title: Flight Simulator Development
Budget Activity: #6 - Defense-Wide Mission Support

C. (U) Major Milestones:

Milestones	Dates
Release Request-for-Proposal	Feb 83
Contract Award for Phase I (two contractors)	Aug 83
Preliminary Design Review	Aug 84
Contract Award for Phase II (one contractor)	Oct 84
Flight Station Available	2nd qtr FY 87
Prototype WST Ready-for-Training (RFT)	1st qtr FY 88
Mission Trainer Ready-for-Training	4th qtr FY 88
WST Production Unit No 5 RFT	4th qtr FY 89

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64411F (63411F) Title: DOD Space Shuttle
DOD Mission Area: Space Launch and Orbital Support, #410 Budget Activity: Defense-wide Mission Support, #6

1. (U) RESOURCES (PROJECT LISTING): ($ In Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
TOTAL FOR PROGRAM ELEMENT		276,700	355,113	337,361	329,385	194,121	2,343,780

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: To increase the effectiveness of Department of Defense space operations, this program will: (1) Support the National Aeronautics and Space Administration development and assure the utility to the Department of Defense of the Space Transportation System; (2) Support transition of critical national defense satellites to the Shuttle; (3) Develop the Inertial Upper Stage; (4) Acquire general purpose Shuttle launch and landing facilities at Vandenberg Air Force Base, CA; and (5) Modify NASA facilities for secure DOD operations. The Air Force, as the Department of Defense executive agent, is responsible for the planning, development, integrated logistics support and activation activities necessary to achieve these objectives.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

		FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
RDT&E	(PE 64411F)	266,000	355,629	293,068		425,035	2,191,300
Procurement (Missile)	(PE 12449F)	200,665	135,954	74,350		96,204	858,220
Procurement (Other)	(PE 12449F)	6,445	6,741	4,213		11,086	86,100
Military Construction	(PE 12449F)	36,190	82,200	66,576		58,276	616,600

The increase in FY 1982, FY 1984 and out year RDT&E funds reflects the increased engineering manpower required during activation and first launch processing at Vandenberg Air Force Base. This increase derives from revised National Aeronautics and Space Administration estimates for Kennedy Space Center manning and from the significantly increased processing time estimates generated from the early Kennedy Space Center launch experience. Increased procurement estimates derive from additional physical and information security protection requirements, from a better estimate of the amount of unique support equipment, and from inflation increases due to delayed procurements.

4. (U) OTHER APPROPRIATION FUNDS:***

		FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Procurement (Missile)	(PE 12449F)	193,900	134,954	195,291	137,761	24,646	1,041,552
Procurement (Other)	(PE 12449F)	6,487	6,741	27,337	16,367	11,664	126,309
Military Construction	(PE 12449F)	36,190	61,750*	49,200	71,977	4,899	610,926**

* Does not include a $17.7M reprogramming (in progress) for the Solid Rocket Booster Disassembly Facility at Port Hueneme, CA

** Includes reprogramming in FY 80 (63,700 and 5,200) and FY 81 (13,700) from other sources

*** Does not include operational funding which is reported separately in PE 35171F, Space Launch Support

Program Element: #64411F (63411F) Title: DOD Space Shuttle
DOD Mission Area: Space Launch and Orbital Support, #410 Budget Activity: Defense-wide Mission Support, #6

5. (U) RELATED ACTIVITIES: This program is directly related to, and paced by, the National Aeronautics and Space Administration Space Shuttle development program. Under interagency agreements, the National Aeronautics and Space Administration will fund for all Shuttle Orbiters, provide the general purpose launch and landing facilities at Kennedy Space Center, FL and perform Shuttle mission control at Johnson Space Center, Houston, TX. The Department of Defense portion of the program will include the development of the Inertial Upper Stage, the acquisition and operation of Space Shuttle launch and landing facilities at Vandenberg Air Force Base, and funding for the unique Department of Defense security requirements levied on the National Aeronautics and Space Administration-developed Space Transportation System elements. National Aeronautics and Space Administration/Department of Defense coordination at all organizational levels assures that the Space Transportation System will meet the needs of both agencies. Department of Defense payload planning efforts are addressed by the Department of Defense Space Shuttle User Committee which includes representatives of the Army, Navy, Air Force, Office of the Secretary of Defense, and Joint Chiefs of Staff. The Air Force Director of Space Systems and Command, Control, Communications chairs this body and also has the responsibility for research and development efforts involving Air Force payloads, expendable launch vehicles and the Shuttle program. Inertial Upper Stage production, Vandenberg operation and maintenance, and Shuttle flight charges paid to the National Aeronautics and Space Administration for United States Air Force users are funded under Program Element 35171F (Space Launch Support). Inertial Upper Stage flight equipment and operation, and Shuttle flight charges for other Department of Defense users are funded by the users' program element. Titan III(34)D/Inertial Upper Stage integration is funded under Program Element 35119F, Space Boosters. Related activities for near term utilization of the Space Shuttle sortie mode capabilities are being pursued by the Space Test Program under Program Element 63402F. The Air Force will begin construction in 1983 of a Consolidated Space Operations Center, funded under Program Element 35130F, to eliminate the vulnerabilities represented by the single critical control nodes of the Satellite Test Center (payload control) and Johnson Space Center (Shuttle control).

6. (U) WORK PERFORMED BY: The Air Force Space Division, El Segundo, CA of the Air Force Systems Command is the development agency for the Air Force Space Shuttle activities. The Aerospace Corporation, El Segundo, CA provides Space Division with general systems engineering support. Martin Marietta (Denver), Vandenberg Air Force Base, CA, completed the contract for the detailed design and is the integrating contractor for the Vandenberg Shuttle facilities and for development and procurement of necessary unique support equipment and software. The National Aeronautics and Space Administration is the procuring agent for all Vandenberg support equipment and software common to both Kennedy Space Center and Vandenberg (Air Force funded). The United States Army Corps of Engineers is the construction agent for all facilities at Vandenberg. Various construction contractors are employed for the actual construction (through the Corps of Engineers). Rockwell International, Downey, CA and United Space Boosters, Huntsville, AL provide expertise on the Orbiter and the Solid Rocket Boosters respectively in support of the Vandenberg Shuttle facilities design and activation. Martin Marietta is also under contract to provide engineering services in support of payload integration activities. Boeing Aerospace Corporation, Seattle, WA was awarded the contract for Inertial Upper Stage full scale development and is also performing spacecraft-to-Inertial Upper Stage integration activities. TRW Systems, Redondo Beach, CA is supporting development of the secure Shuttle mission control capability at the Johnson and Kennedy Space Centers. International Business Machines, Houston, TX is under contract to evaluate specialized Orbiter flight software for Department of Defense missions.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: None

Program Element: #64411F (63411F) Title: DOD Space Shuttle
DOD Mission Area: Space Launch and Orbital Support, #410 Budget Activity: Defense-wide Mission Support, #6

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

A. (U) Program Description: The Space Task Group, established by the President in 1969, recommended that a Space Transportation System be developed to provide more flexible and effective access to space at lower costs than current expendable launch vehicles. In January 1972 the President authorized the National Aeronautics and Space Administration to proceed with the development of the reusable Space Shuttle as a national means for transporting payloads to and from space. The Space Transportation System consists of the Space Shuttle Vehicle which will carry payloads to low earth orbit and return to land on a runway; upper stages to transfer payloads from low earth orbit to higher orbits; and associated ground and airborne support systems. The Space Shuttle Vehicle consists of the Orbiter (the winged, recoverable spacecraft, the size of a DC-9), an External Tank containing fuel and oxidizer for the Orbiter's main engines, and a pair of recoverable Solid Rocket Boosters which will provide initial boost acceleration for the vehicle. The reusable Orbiter will carry the payload (spacecraft and, if required, upper stage) into orbit in its 15x60 foot payload bay. The system will have the capability to boost 32,000 pounds of payload to a near-polar (98°) orbit, or 65,000 pounds into an Easterly (28.5°) orbit. After reentry, the Orbiter will land on a runway using a high speed, unpowered approach. The Orbiter and Solid Rocket Boosters will be recovered, refurbished, and reused. The facilities at the two launch bases Kennedy Space Center, FL and Vandenberg Air Force Base, CA accomplish the recovery, refurbishment, and reintegration of the major components of the Space Shuttle Vehicle to prepare it for its next launch. The National Aeronautics and Space Administration mission control center at Johnson Space Center will be used for mission planning and control until the Department of Defense acquires a dedicated capability, the Consolidated Space Operations Center. The Space Transportation System will be the primary launch system for DOD payloads.

(U) The Air Force participates in the Shuttle program to assure that critical national defense missions will continue to be effectively supported. Although the National Aeronautics and Space Administration is responsible overall for the Space Transportation System, the Air Force defines Department of Defense operational and support requirements and assesses the effect of Shuttle design changes on Department of Defense national security missions. The Air Force addresses the unique Department of Defense needs to assure the maximum operational utility of the expanded space mission capability offered by the Shuttle. In addition, the long term advantages of the Shuttle to the Department of Defense appear to be substantial, particularly in the areas of payload retrieval, on-orbit repair, assembly of very large structures in space, and the availability of an orbital test bed -- modes of operation unavailable without the Shuttle.

(U) To minimize the operational impact of modifying Department of Defense payloads and to make early effective use of the Shuttle, the Department of Defense and the National Aeronautics and Space Administration agreed that the Air Force will develop an expendable upper stage for use with the Shuttle - this stage is called the Inertial Upper Stage. The Inertial Upper Stage will also be used on the Titan III(34)D launch vehicle for certain Department of Defense payloads during transition to the Shuttle. The Inertial Upper Stage will be used on Shuttle by both the Department of Defense and the National Aeronautics and Space Administration.

(U) The Department of Defense has also agreed to acquire and operate the Space Shuttle launch and landing facilities at Vandenberg Air Force Base, CA with an initial launch capability date of October 1985. This agreement was reached after an extensive study determined that Department of Defense and National Aeronautics and Space Administration requirements could not be satisfied from one launch site, and that use of a second site at Vandenberg was necessary for polar orbit missions. The heavier near-polar missions cannot be accomplished from the Kennedy Space Center, FL since that would require overflight of the continental United States while sub-orbital and result in the large Shuttle external tank being released on a ballistic trajectory over the Sino-Soviet land mass for impact in the Indian Ocean. 851

Program Element: #64411F (63411F) DOD Mission Area: Space Launch and Orbital Support, #410

Title: DOD Space Shuttle Budget Activity: Defense-wide Mission Support, #6

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Development of the two-stage Inertial Upper Stage neared completion. Inertial Upper Stage production continued (funded by Program Element 35171F, Space Launch Support, for Air Force payloads; by the user for other Department of Defense programs; and through the National Aeronautics and Space Administration for civil/commercial missions). The Vandenberg Ground Support System construction, equipment installation, and checkout continued toward an Initial Launch Capability in October 1985. The construction funded in the 1982 program included launch pad modifications, the Integrated Operations Support Center, flight crew facilities, and the Space and Missile Test Organization Management and Engineering Facility. Significant cost increases occurred in the Vandenberg development and procurement funding estimates due to increased concurrency with the Kennedy (East Coast) launch site development, design problems in the launch pad, and the difficulty in hiring engineers. Construction of the Shuttle Payload Integration Facility at Cape Canaveral Air Force Station, FL continued toward an initial operational capability of June 1983. Modifications to Kennedy, Goddard, and Johnson Space Centers continued to allow classified processing ("Controlled Mode") to support the first classified mission in 1983. Payload integration activities continued.

(2) (U) FY 1983 Program: The highly successful first flight of the Titan III(34)D/IUS configuration occurred in Oct 82. IUS full scale development will be completed with the flight and subsequent analysis of the first Shuttle/Inertial Upper Stage launch in 1983 (a National Aeronautics and Space Administration mission). Inertial Upper Stage flights will continue using pre-production vehicles. Inertial Upper Stage production will continue (funded by the user programs). The Vandenberg Ground Support System construction, equipment installation, and checkout will continue toward the October 1985 first launch capability. Construction will begin on the Shuttle Assembly Building (the remaining element of the launch pad facilities). Construction will be completed on most of the major facilities: Orbiter Maintainance and Checkout Facility, External Tank Storage and Checkout Facility, and the Launch Pad (except the Shuttle Assembly Building). Ground system tests will begin for the Launch Control Center. The Shuttle Payload Integration Facility at Kennedy Space Center will reach its Initial Operational Capability. "Controlled Mode" at Johnson Space Center will reach its Initial Operational Capability for the first Department of Defense dedicated flight. Payload integration activities will continue on schedules compatible with the launch requirements of the individual payloads.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The construction and activation of the Vandenberg launch and landing site will continue toward the October 1985 launch capability date. Construction will be completed on all major facilities comprising the Vandenberg capability. Equipment installation will be completed and ground system testing will have begun for all major facilities except the Solid Rocket Booster Disassembly Facility (at Port Hueneme, CA). Construction will begin on the Hazardous Waste Disposal facilities, the Thermal Protection System support facility, and the modifications to the launch pad to control ice buildup on the External Tank after it is loaded with propellants. Activation activities for the launch capability continue including the stacking of the Flight Verification Vechicle (a non-flight worthy Space Shuttle) to test mechanical sequences and fit, to train the processing crew, and to conduct payload processing tests (with a test model spacecraft). Processing of the flight ready Space Shuttle and payload begin in FY 85. Modifications for secure operations at Johnson, Goddard, and Kennedy Space Centers and payload integration activities will continue.

Program Element: #64411F (63411F) Title: DOD Space Shuttle
DOD Mission Area: Space Launch and Orbital Support, #410 Budget Activity: Defense-wide Mission Support, #6

(4) (U) Program to Completion: Initial Vandenberg construction and activation will be completed for the October 1985 launch capability. If necessary, additional construction packages will be used to allow (a) growth to higher launch rates as mission requirements dictate and (b) incorporation of the National Aeronautics and Space Administration selected option for further thrust augmentation capability (if required to achieve specified performance for near polar missions). Secure operations modifications will be completed on both coasts. Primary mission control responsibility for defense missions will transition to the Consolidated Space Operaions Center (Johnson Space Center capability for secure operations is retained as a backup).

C. (U) Major Milestones:

	Milestones		Dates
1.	Vandenberg Air Force Base Design Criteria Start		Oct 75
2.	Inertial Upper Stage Validation Phase Start		Sep 76
3.	Inertial Upper Stage Full Scale Development Start		Apr 78
4.	Vandenberg Air Force Base Construction Start		Jan 79
5.	Inertial Upper Stage Initial Launch Capability (Titan III)	*(Sep 82)	Oct 82
6.	Inertial Upper Stage Initial Launch (Shuttle)	*(Jan 83)	Spring 83
7.	Johnson Space Center Controlled Mode Initial Operational Capability	*(Mar 83)	Jun 83
8.	Kennedy Space Center Shuttle Payload Integration Facility Operational Capability		Jun 83
9.	Goddard Space Flight Center Security Modification Initial Capability		Jul 83
10.	Vandenberg Air Force Base Initial Operational Capability		Oct 85
11.	Vandenberg Air Force Base Thrust-Augmented Launch Capability		Oct 85

*Date presented in FY 83 Descriptive Summaries.

(U) Explanation of Milestone Changes:

5. The initial launch capability of the Titan III version of the Inertial Upper Stage slipped due to additional on pad testing. The launch was an outstanding success.

6. IUS initial launch on Shuttle delayed due to Hydrogen leak in "Challenger" main engine.

7. Delays were made to adjust the requirement for this capability to the dates required to support the first dedicated Department of Defense flight -- which was also delayed.

Budget Activity: Program-wide Management and Support, #6
Program Element: #64411F - Space Shuttle

Test and Evaluation Data:

1. (U) Development Test and Evaluation: The National Aeronautics and Space Administration and the Air Force are each developing, acquiring and operating a portion of the common-use hardware and facilities of the Space Transportation System. The National Aeronautics and Space Administration has development and operation responsibilities for the Space Shuttle Vehicle, the East Coast Shuttle launch and landing facilities at Kennedy Space Center FL, and the Mission Control Center at Johnson Space Center TX. The Department of Defense is developing the Inertial Upper Stage and will develop and operate the West Coast Shuttle launch and landing facilities at Vandenberg Air Force Base CA. and the controlled mode secure operations capability at JSC. The Air Force is planning a Consolidated Space Operations Center funded under PE 35130F for a fiscal year 1986 operational capability to augment and backup the present Satellite Control Facility at Sunnyvale CA and to provide a dedicated Department of Defense Shuttle control capability. Air Force test and evaluation activities are being conducted as a combined Development Test and Evaluation/ Operational Test and Evaluation program.

(U) Department of Defense Assessment of National Aeronautics and Space Administration Segments: The Air Force Systems Command -- with Air Force Test and Evaluation Center participation and support from other Air Force agencies -- will assess the capability (performance and availability) of the National Aeronautics and Space Administration developed segments to support Department of Defense requirements. This evaluation activity consists primarily of monitoring and evaluating major Space Transportation System verification and processing events conducted by the National Aeronautics and Space Administration.

(U) Air Force test participation began with monitoring of the Approach and Landing Tests conducted at Edwards Air Force Base CA from February 1977 to March 1978. These tests successfully demonstrated the low speed flying and manual landing characteristics of the Orbiter vehicles as well as the adequacy of the ferry capability of a modified Boeing 747 Shuttle Carrier Aircraft. Subsequently, the Mated Vertical Ground Vibration Test, conducted at the Marshall Space Flight Center from March 1978 to February 1979, was monitored. This test satisfactorily provided the required information to validate the analytical model used to design and verify the structural capability of the Space Shuttle Vehicle and, subsequently, update the predictive models used to calculate the environments seen by Department of Defense payloads while in the Shuttle payload bay.

(U) Progress of the Space Shuttle Main Engine development has been continuously monitored since January 1978 due to its critical role in Space Shuttle V[illegible]cle performance and schedule. The engine has performed at full power (109% of rate power level); however, hardware design and reliability problems have caused major program delays. The Main Propulsion

Budget Activity: Program-wide Management and Support, #6
Program Element: #64411F - Space Shuttle

Test at the National Space Technology Laboratories began in April 1978 and completed Test Objectives vital for first manned orbital flight in January 1981. Full power level development testing is proceeding. An additional Main Propulsion Test firing at full power level (109%) is required in 1982 to certify readiness of the Space Shuttle Vehicle for full operational capability.

(U) The Shuttle Avionics Integration Laboratory at Johnson Space Center is used to verify avionics hardware and software compatibility and to provide confidence in the ability of these subsystems to successfully perform the flight sequences planned for the Orbital Flight Test program and subsequent missions. This ongoing program started in March 1979 and has been successful in identifying and correcting a number of hardware and software configuration discrepancies. The Air Force will continue monitoring the test progress and results from this activity.

(U) The Orbital Flight Tests (four flights scheduled from April 1981 through July 1982) provided data for the Air Force participation in formal National Aeronautics and Space Administration verification activities. Since not all Department of Defense concerns were answered during the Orbital Flight Tests, Air Force test activity will continue to include operation flights until all critical DOD issues are adequately addressed.

(U) IUS Test Program: A Defense Systems Acquisition Review Council Milestone II review of the Inertial Upper Stage program was held in March 1978 and approved proceeding with full scale development. The Boeing Aerospace Company is on contract for the full scale development phase. The Defense Systems Acquisition Review Council also approved production of an initial quantity of nine (subsequantly reduced to eight) Inertial Upper Stage vehicles (four STS configured and four Titan 34D configured) to meet planned flight schedules for both NASA and the DOD. Because of the high cost and immediate operational use of Department of Defense developed Space Transportation System flight hardware (there will be no dedicated test launches of an Inertial Upper Stage), a combined Development Test and Evaluation/ Operational Test and Evaluation program is being conducted. The Inertial Upper Stage test and evaluation will focus on system performance, reliability, maintainability, and compatibility with the Space Transportation System.

(U) The most critical Inertial Upper Stage development items are avionics component qualification, flight software and the long-duration burn solid rocket motors.

(U) Qualification testing of the Inertial Upper Stage avionics began in August 1979 and was completed in mid 1982. The primary problem affecting the avionics system was the unavailability of high reliability space-qualified electronic piece parts. That problem is now solved.

Budget Activity: Program-wide Management and Support, #6
Program Element: #64411F - Space Shuttle

(U) In the Inertial Upper Stage software area, the flight software was developed by and tested at the Boeing Aerospace Corporation facility in Kent WA. The first flight software has been designed, coded and being tested. Martin Marietta Corporation is performing the independent verification and validation. The mission data loads are being designed for the first three Department of Defense spacecraft and for the first National Aeronautics and Space Administration-sponsored Tracking and Data Relay Satellite. Development and validation and verification testing of the operational software in time to support an initial launch date of Oct 1982 of a Titan III (34) D/Inertial Upper Stage is proceeding.

(U) Propulsion system development testing is proceeding. To date, seven solid rocket motor cases have been burst tested and four cases have been skirt tested. IUS motor case development and verification have been an outstanding success. Motor case efficiency is at the forefront of state of the art level and case burst data show very little scatter. Skirt ultimate loads have been demonstrated four times. In addition to the four full scale nozzle firing tests five large IUS motors and seven small IUS motors including one spin motor have been successfully fired at the Arnold Engineering and Development Center, TN. This completed the motor development phases program. Two motor firings included the Extendible Exit Cone which was deployed to the test. Twelve additional motors (six small and six large) will be fired for the qulification test program. These Qual firings will begin in Nov 81 and continue through Dec 82. The problem of propellant cracking in the boot area of the solid rocket motor has been solved and verified by cold X-rays of four qualification motors (two of each size) prior to casting of the flight motor. Flight motor casting has commenced.

(U) The development phase of Inertial Upper Stage/booster separation and shock testing was completed on a development test vehicle in November 1978 and demonstrated that the actual shock spectrum was less that predicted. Structural qualification testing of the Titan 34D configuration was initiated in April 1980 and completed in September 1980. Qualification of the Space Transportation System Configuration started in September 1981 and was completed in Feb 82. The Inertial Upper Stage qualification test vehicle structure has been completed and the vehicle, using inert solid rocket motors, has been stacked. The Qualification Test Vehicle (QTV) testing started in October 1980 and was completed in December 1981.

(U) The ground test portion of the Inertial Upper Stage program will be concluded with a series of environmental simulation tests to be performed on the qualification test vehicle at Boeing and with processing of the Inertial Upper Stage pathfinder vehicles through each of the facilities at Cape Canaveral Air Force Station and Kennedy Space Center required to process an Inertial Upper stage for an operational launch.

(U) Vandenberg Air Force Base Ground Support System Testing: The Martin Marietta Aerospace Company is on contract to verify the system requirements, equipment, and facility specification for the Vandenberg Air Force Base launch and landing site. Facilities construction and equipage is in progress with Martin as integrating contractor. Ground Support System testing will focus on ground processing of the Space Shuttle Vehicles, ground operations, supportability, Air Force manpower/resources, and contractor support.

Budget Activity: Military Astranautics and Related Equipment, #4
Program Element: #63411F, 64411F-Space Transportation System (STS)

Test and Evaluation Data:

2. (U) Operational Test and Evaluation (OT&E): Air Force test activities are being conducted on the Department of Defense (DOD) segments as a combined development test and evaluation/operational test and evaluation (DT&E/OT&E) test program. The Air Force Test and Evaluation Center (AFTEC) will: (1) independently evaluate and report on the DOD segments, (2) participate with the Air Force Systems Command (AFSC) in National Aeronautics and Space Administration (NASA) verification activities, and (3) work with AFSC to provide an overall systems level assessment of the STS capability to meet DOD requirements.

a. DOD assessment of NASA Segments: AFTEC is participating with AFSC in monitoring and observing the NASA test activity and assuring the capabilities of the STS. This evaluation activity primarily consists of monitoring NASA STS verification efforts conducted at Kennedy Space Center (KSC) FL; Johnson Space Center (JSC), TX; and Edwards AFB (EAFB), CA. The primary focus of USAF involvement in NASA activity is to determine the availability and the capability of the STS to support DOD requirements. All KSC ground flow activity and launch operations, JCS flight operations, and landing operations at both EAFB and White Sands, NM were observed for STS-1 through STS-4 by a combined AFTEC-AFSC test team and test reports were published on all significant operations. Due to the development nature of the first four STS flights, no overall assessment is practical, but the areas of performance and launch rate were flagged as requiring in-depth review since data indicate that the STS might not reach design or operational requirements.

b. Inertial Upper Stage (IUS) Test Program: IUS T&E is focusing on system performance, reliability maintainability, and compatibility with the STS and payloads. IUS test activity is being performed at the Boeing facilities in Kent, WA and Cape Canaveral Air Force Station (CCAFS), FL. The actual buildup and checkout of the IUS is handled by contractor personnel. AFTEC will provide an independent evaluation and assessment of the IUS system. AFTEC and AFSC is currently conducting a combined DT&E/OT&E program by observing IUS factory test and IUS pathfinder test vehicle processing at CCAFS. AFTEC published an IUS interim status report in April 1982.

c. Vandenberg AFB, (VAFB) Ground Support System (GSS) Test Program: VAFB GSS testing will focus on compatibility of ground processing equipment with the space shuttle vehicle, ground operations, supportability, USAF manpower/resources, and contractor support. Much of the ground processing data obtained at KSC will be applicable to VAFB due to the similarity of STS equipment, facilities, and procedures. The OT&E test team will initially be located at Cape Canaveral AFS to begin collecting data as a baseline for the GSS evaluation and the team will subsequently transition to VAFB during FY 84. The GSS evaluation will continue through the VAFB full operational capability scheduled for late 1986. AFTEC will provide an independent evaluation and assessment of the VAFB GSS.

d. Operations Capability Development: AFTEC will participate in testing of the other DOD segments and provide independent assessments of operational suitability and effectiveness.

e. The following OT&E report has been published:

Inertial Upper Stage (IUS) OT&E, October 1980 to December 1981, Status Report, dated April 1982.

Budget Activity: Program-wide Management and Support, #6
Program Element: #64411F - Space Shuttle

The test program will include acceptance testing of support equipment and facilities, installation testing of support equipment, station set verifications, and special test of the Ground Support System during processing of the flight vehicle hardware leading to an initial operational capability target date of October 1985. A combined test program is planned to satisfy both development test and evaluation and operational test and evaluation objectives. In addition to the testing of on Vandenberg unique ground support equipment, the Air Force will ensure that the NASA designed common support equipment meets Department of Defense requirements. Ground processing data obtained at Kennedy Space Center will be applicable to Vandenberg Air Force Base due to similarity. DOD will use the lessons learned at KSC, in the development of VLS. The Vandenberg Launch capability will be developed to meet early launch requirements while providing a moderate growth through an additional increment of facilities and equipment to a capability of approximately ten launches per year as national requirements dictate. The Ground Support System evaluation will continue through attainment of the ten launches per year capability.

(U) Operations Capability Development: All the activities (other than Inertial Upper Stage and Vandenberg) necessary to provide an orderly processing and integration of Defense payloads are included. Test and evaluation of the Inertial Upper Stage flight planning and control; Department of Defense security requirements; development of facilities, hardware, and analytical services needed to integrate Department of Defense payloads into the Orbiter; and documentation and services is planned.

Budget Activity: Program-wide Management and Support, #6
Program Element: #64411F - Space Shuttle

3. System Characteristics: The key performance parameters of the National Aeronautics and Space Administration and Department of Defense developed segments are shown below:

NASA SEGMENT - SPACE SHUTTLE VEHICLE

ITEM	OBJECTIVE	CURRENT ESTIMATE	DEMONSTRATED	REMARKS
Payload to 160 nautical miles 28.5° inclination	65,000 pounds	65,000 pounds *	32,700 pounds (Orbiter Vehicle 104)	Baseline Reference Mission 1
Payload to 150 nautical miles 98°inclination	32,000 pounds	28,300 pounds * 33,500 pounds **		Baseline Reference Mission 4
Payload to Geosynchronous (Shuttle-Centaur G)	10,000 pounds	10,000 pounds	0 pounds	

* - Mature OV-103 Performance (requires improvements in Space Shuttle Main Engine thrust and Space Shuttle Vehicle weight.

** - Mature OV-103 Performance with Performance Augmentation (Filament Wound Cases for the Solid Rocket Boosters)

AIR FORCE SEGMENT - INERTIAL UPPER STAGE

ITEM	OBJECTIVE	CURRENT ESTIMATE	DEMONSTRATED	REMARKS
Payload to Geosynchronous (Shuttle Version)	5,000 pounds	5,087 pounds		With Extendable Exit Cone
Payload to Geosynchronous (Titan Version)	4,000 pounds	4,040 pounds		With Extendable Exit Cone

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64609F
DOD Mission Area: #473 - Defense Sys Cost - Effectiveness/Imp

Title: Logistics Technology for Weapon Systems
Budget Activity: #6 - Defense-wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0	0	10,057	14,226	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The program element for Logistics Technology for Weapon Systems establishes the Weapon System Support Development (WSSD) Program to validate and accelerate the transition of new laboratory technologies with a good potential for improving logistics, into prototype, or full scale development, and/or production programs as AFR 57-4 Class II & III modifications. The aim of this effort is to improve recipient weapon system supportability. The WSSD will consider as candidates for transition only those technologies, which might not otherwise be considered for transition, due to potential programmatic impacts on the primary weapon system, i.e., performance/cost and/or schedule impacts. Emphasis will be placed on only those efforts that will provide a significant payoff to the Air Force. Any candidate that can be transitioned through normal programming with minimum risk will not be sponsored under this project.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	0	0	0	0	Continuing	Not Applicable

Program is an FY 84 new start.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands) - Not Applicable.

5. (U) RELATED ACTIVITIES: The efforts to be initially undertaken in this program interface with PE 27133F, F-16 Squadrons, and PE 41119F, C-5 Airlift Squadrons.

6. (U) WORK PERFORMED BY: Contract awards would not be expected until late FY 84. Overall management of the effort will be done by Air Force Systems Command, Aeronautical Systems Division, Wright-Patterson AFB.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

A. (U) Project: (Logistics Technology for Weapon Systems): In Dec 78 Secretary of the Air Force directed creation of a logistics research program. A staff study team provided recommendations in Oct 79 on the organizational structure and concept of operations required to initiate such a program. Air Force, with resource support from AFLC,

Program Element: #64609F | Title: Logistics Technology for Weapons Systems
DOD Mission Area: #473 - Defense Sys Cost - Effectiveness/Imp | Budget Activity: #6 - Defense-wide Mission Support

subsequently created the Air Force Coordinating Office for Logisitcs Research (AFCOLR) in Sept 80. In a joint memo dated 3 Dec 80, the Secretary of Defense directed increased emphasis on logistics oriented R&D programs by each of the Services. The Services were tasked to develop hardware techniques, system design approaches, and new support concepts which reduce the support burden of our weapon systems. An internal review of the USAF logistics R&D activity indicated potential for improvement in our efforts to transition promising logistics technologies from the laboratory into weapon systems. The Weapon System Support Development (WSSD) program was established. The WSSD will assume the following responsibilities: select, for subsequent approval by a Review Group, candidate laboratory technologies with high payoff potential for reducing the weapon systems support burden; and, fund the validation efforts necessary to prepare the approved projects for transition into weapon systems. These validation projects will be conducted in parallel with, but separate from, the baseline System Program Office (SPO) efforts. Successful projects will subsequently be integrated into the primary weapon system by the recipient SPO as a Preplanned Product Improvement Program (P^3I) action. This procedure will ensure timely demonstration of technology applications for improving weapon system supportability, without initial dependence on the recipient weapon system development program.

B. (U) Program Accomplishments and Future Efforts:

(1 1982 Accomplishment: Not applicable, FY 84 New Start.

(2) (U) FY 1983 Program: Program direction provided to Air Force Systems Command to establish a WSSD program office and prepare to begin a fully funded effort in FY 1984. Work being conducted in FY 83 is level of effort and very low key. Funding is being provided out of PE 65806.

(3) (U) FY 1984 Planned Program and Basis for 1984 RDT&E Request: Actions will be initiated to develop a Multi-functional Integrated Power Unit (MIPU) onto the F-16 fighter, integrate an Onboard Inert Gas Generator (OBIGGS) onto the C-5A currently under redesign for wing configuration changes. FY 85 new starts will be identified and approved. MIPU, will provide a fully capable auxiliary/emergency power unit for autonomous aircraft operations. Will eliminate need for ground support equipment. Design is not unique and therefore no extreme service requirements will exist. The system will eliminate the requirement to carry onboard Hydrazine and LOX so unique service requirements will be reduced. The design will result in a higher MTBF of electrical systems due to the incorporation of a Variable Speed Constant Frequency power generator. Estimated LCC payback is greater than 5 to 1 (max). Overall A/C readiness is grossly improved with a very small support tail requirement during periods of rapid deployment. Estimate cost savings due to reduced support requirements is $135M over 15 years for a 500 A/C fleet. OBIGGS, provides an onboard inert gas generator system for explosion protection of military aircraft. Used to reduce vapor pressure in fuel tanks. Eliminates ground LN_2 support requirements, and eliminates need for inertial foam in fuel tanks which deteriorates over time and tends to damage fuel lines. Cost savings is estimated at $620M over 20 year period for 200 cargo A/C fleet.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64707F
DOD Mission Area: #420 - Defense-wide Mission Support

Title: Weather Systems (Engineering Development)
Budget Activity: #6 - Defense-wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ in Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	3,486	4,064	8,111	2,405	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The increasing emphasis on Air Force operations during night and bad weather makes the rapid and accurate determination of weather conditions of increasing importance. The Air Force needs to use weather intelligence as a force intensifier. This requires an upgrade in weather support equipment. Several development efforts are required to make this upgrade possible. These include development of equipment to process, display, and disseminate weather data and forecasts in fixed-base and tactical weather stations, and development of a doppler weather radar. Through existing technology in minicomputers, displays, and communications equipment, the development and fielding of the Automated Weather Distribution System will partially automate 183 base weather stations around the world to significantly improve timeliness and accuracy of weather intelligence. A joint Department of Defense/ Department of Commerce/Department of Transportation doppler weather radar (called Next Generation Weather Radar) will for the first time, allow direct measurement of winds within storms which is vital to forecasting tornadoes, damaging winds, and damaging hail.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: (in thousands)

RDT&E	3,786	4,064	8,417		Continuing	N/A

FY 1982 funds were transferred to PE 63707F. FY 1984 - Inflation indices reductions.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable

5. (U) RELATED ACTIVITIES: Program Element 64707F began in FY 1981 as an outgrowth of Project 2093, Weather Systems, PE 64708F, Other Operational Equipment. PE 63707F, Weather Systems (Advanced Development), accomplishes advanced development projects whose results support PE 64707F. Funds for procurement of systems developed in PE 64707F are included in PE 35111F, Weather Services.

6. (U) WORK PERFORMED BY: Program management for the Automated Weather Distribution System is provided by Electronic Systems Division, Hanscom Air Force Base, MA. Development of the Advanced Weather Radar is pursued by the Joint System Program Office for Next Generation Weather Radar which is located within the Department of Commerce.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64707F
DOD Mission Area: #420 - Defense-wide Mission Support

Title: Weather Systems (Engineering Development)
Budget Activity: #6 - Defense-wide Mission Support

7\. (U) WEATHER SYSTEMS (ENGINEERING DEVELOPMENT) (SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984): The increasing emphasis on Air Force operations during night and bad weather makes the rapid and accurate determination of weather conditions of increasing importance. The efforts in this project will fund development of equipment and techniques for a badly needed upgrade of Air Force Air Weather Service support. This upgraded weather support will make weather intelligence a force intensifier on the battlefield and will develop greatly improved severe storm detection and warning through joint agency efforts. The following are addressed: AUTOMATED WEATHER DISTRIBUTION SYSTEM which will automate most weather data handling tasks within each Air Weather Service weather station at major Air Force Bases, some Army installations, and Air Force tactical facilities. This system will use a minicomputer to accelerate data handling, incorporate more efficient forecast preparation techniques, and speed dissemination of precise and up-to-date weather intelligence. Once observations, forecasts, and weather warnings become available, the system will display them to the forecaster and local users. In FY 1982 the system specifications were determined and the Request for Proposal was prepared. The development contract will be let in mid FY 1983 and system development will continue through FY 1984. The NEXT GENERATION WEATHER RADAR, a joint Departments of Defense/Commerce/Transportation development and procurement effort, will provide a greatly improved storm detection and warning capability. This radar will detect severe surface wind, hail, tornadoes and turbulence using doppler techniques; automate thunderstorm tracking; accelerate severe thunderstorm identification; and improve warning accuracy and timeliness through use of interactive warning preparation techniques. In FY 1982 the system specifications were determined. The request for proposal for the system validation phase was released 1 October 1982; contract award will occur in June 1983. In FY 84 validation phase II will begin with the construction of the prototype hardware. An audit of the progress of each contractor will be the basis to determine if one or both contractors will be continued through phase II. Development of the prototype radar system(s) will continue through FY 1987.

8\. PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64735F
DOD Mission Area: Other Test and Evaluation Support

Title: Range Improvement
Budget Activity: #6 - Defense-Wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	22,877	25,311	18,044	20,228	Continuing	Not Applicable
2152	Mission/Engineering Support	3,377	2,624	3,818	3,401	Continuing	Not Applicable
2285	Threat Systems	15,900	12,187	9,800	11,100	Continuing	Not Applicable
2286	Instrumentation	3,600	4,000	4,426	5,727	Continuing	Not Applicable
6510	Flight Test Simulators	0	6,500	0	0		

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Wartime experience has shown that a disproportionate number of losses occur among aircrews during their first ten combat missions. There is a continuing requirement to reduce those losses by more realistic training and testing. Additionally, the growing costs of modern weapon systems makes it imperative that the effective utilization of test and training resources be improved as much as possible. This program contributes to the qualitative improvement of combat operational forces by developing instrumentation and threat simulator systems to increase the effectiveness of Development and Operational Test and Training and large scale exercises world wide.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

RDT&E	22,700	25,587	23,500	----	Continuing	Not Applicable
Procurement, Other (PE #27429F)*	39,673	42,167	68,217	----	Continuing	Not Applicable*
Procurement, Other (PE #11897F)*	14,058	13,699	37,965	----	Continuing	Not Applicable*
Procurement, Aircraft (PE #27429F)*	6,400	6,800	4,300	----	Continuing	Not Applicable*

* Includes initial spares

The RDT&E reduction in FY 84 resulted from the transfer of Project 6510 Flight Test Simulators to Program 64755F, Improved Capability for DTE, to align the project with DTE ranges.

Program Element: #64735F
DOD Mission Area: Other Test and Evaluation Support

Title: Range Improvement
Budget Activity: #6 - Defense-Wide Mission Support

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands) - Not applicable.

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
Procurement, Other (PE #27429F)*	40,353	46,617	52,445	96,494	Continuing	Not Applicable
Procurement, Other (PE #11897F)*	11,952	36,855	29,413	52,851	Continuing	Not Applicable
Procurement, Aircraft (PE #27429F)*	6,967	4,324	7,800	13,700	Continuing	Not Applicable

* Includes initial spares

5. (U) RELATED ACTIVITIES: None.

6. (U) WORK PERFORMED BY: This program is managed by the Armament Division, Eglin AFB FL. Major contractors include Cubic Corp, San Diego, CA; General Dynamics Corp, Ft Worth, TX; Emerson Electric Corp, St Louis, MO; and Metric Corp, Ft Walton Beach, FL; Martin-Marietta, Denver, CO.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: (2152 - Mission/Engineering Support) - This project provides the basic operating capital, system software acquisition and systems engineering support for the program. Basic operating support includes temporary duty costs, equipment and supplies. Software acquisition provides research and development funds for project software development. Engineering support provides technical evaluations, documentation and development tasks which improve the simulated operational threat environment, instrumentation and range support equipment. The majority of this effort is currently being accomplished by a Systems Engineering and Technical Assistance contractor.

B. Project: (2285 - Threat Systems) - This project develops simulators of Soviet threat radars to test our weapons systems and train our aircrews for combat. Our weapons need to be tested against the latest Soviet systems to insure our systems are effective. Our aircrews need to train against Soviet systems to be combat ready. In FY 82 and 83 development work was conducted on the AN/MLQ-T4 Ground Jammer, the AN/MPS-TYY, the AN/MSQ-T13 Update, the AN/MSQ-T11A, the GCI-C^2, the T5C^2, the D Band Communication Data Link Jammer, the Laser Acquisition Weapon System, the Modular Threat Emitter, the On Board Electronic Warfare System and Visual Cueing. [

] and the On Board Electronic Warfare System (autonomous capability to train without a ground range). In FY 82 and 83 development work was conducted on ACMI (Air Combat Maneuvering System), Missile End Game System, and envelope scoring.

Program Element: #64735F
DOD Mission Area: Other Test and Evaluation Support

Title: Range Improvement
Budget Activity: #6 - Defense-Wide Mission Support

C. (U) Project: (2286 - Instrumentation) - This project develops instrumentation for our ranges to test weapon systems and train our aircrews efficiently and effectively. In FY 84, development continues on Air Combat Maneuvering Instrumentation systems with the Navy to improve the capabilities of the system. Development work begins on Range Measuring System Update for Nellis AFB, integrating range instrumentation systems into airborne platforms for drone control at Tyndall AFB and the Strategic Range Center Aircrew Debriefing System.

8. (U) PROJECT OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64747F — Title: Electromagnetic Radiation (EMR) Test Facilities
DOD Mission Area: #454 - Other Test & Evaluation Support — Budget Activity: #6 - Defense-wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	3,088	7,487	7,202	7,943	Continuing	Not Applicable
1209	Nuclear Effects Simulation Test Facilities	1,750	6,009	5,780	6,573	Continuing	Not Applicable
2064	HAVE NOTE	1,338	1,478	1,422	1,370	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Nuclear weapon detonations generate electromagnetic pulses which can damage electronic components. Nonnuclear electromagnetic emissions such as jamming, may also result in component damage. The equipment malfunctions resulting from these electromagnetic environments may cause a significant reduction in weapon system effectiveness. This program element provides funds to operate and maintain test facilities and analysis capabilities to determine the ability of weapon systems to operate in nuclear (project 1209) and nonnuclear (Project 2064) electromagnetic environments.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	3,100	7,500	7,600	----	Continuing	Not Applicable

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands) - Not Applicable.

5. (U) RELATED ACTIVITIES: Nuclear Effects Simulation Test Facilities, Project 1209, is related to Program Element 64711F, Systems Survivability (Nuclear Effects). Work performed under Program Element 64711F develops weapon system nuclear effects survivability assessment, testing and hardening techniques, while Project 1209 is directed at implementing a testing capability for one nuclear effect, electromagnetic pulse. The Air Force Weapons Laboratory is responsible for coordinating these efforts. Project 2064 (HAVE NOTE) is the Air Force implementation of the Office of the Under Secretary of Defense Research & Engineering directed Special Electromagnetic Interference Project which directs all three services to test their air-launched weapons and share test results and conclusions. Tri-service reviews are held periodically.

6. (U) WORK PERFORMED BY: Project 1209 is managed by Air Force Systems Command through the Air Force Weapons Laboratory, Kirtland Air Force Base, NM. BDM Internation, Inc. McLean Va., is the facilities support contractor. Project 2064 is managed by Air Force Systems Command through the Rome Air Development Center, Griffiss Air Force Base, NY. The test

Program Element: #64747F
DOD Mission Area: #454 - Other Test & Evaluation Support

Title: Electromagnetic Radiation (EMR) Test Facilities
Budget Activity: #6 - Defense-wide Mission Support

support contractor is Atlantic Research Corp., Washington, D.C. Hardness criteria development for acquisition specifications and standards is performed by Electical Engineering Station, Georgia Institute of Technology, Atlanta, GA.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: (1209 - Nuclear Effects Simulation Test Facilities): This program is for development, acquisition and baseline support of test facilities which simulate the nuclear electromagnetic environments in which weapon systems may be required to operate. The principal nuclear simulation facilities are the vertically and horizontally polarized electromagnetic pulse dipoles and the in-flight electromagnetic pulse simulation facility (TRESTLE). These facilities are used to test aircraft and missile systems in various operational configurations. Additional capabilities include portable electromagnetic pulse generators for remote site tests and a laboratory used for testing of individual electronic components. Weapon systems program offices arrange for testing time and provide test resources and test costs.

(1) (U) FY 1982 Achievements: Testing of the B-52 continued. Testing of the TACAMO, FB-111 and F-14 was conducted. Improvements to instrumentation, data acquisition systems and pulse generators was continued. Planning for upgrade to the TRESTLE to support E-4B testing was conducted to allow actual I&M work to begin in late FY 3.

(2) (U) FY 1983 Planned Program: Electromagnetic pulse testing of the B-52, EC-130 is scheduled. Upgrades of the facilities are planned to meet the defined threat levels and provide testing capability of the Trailing Wire Antenna on the E-4B and EC-135. Facility improvement which enhance test capabilities will continue. Additional funds for improvements of facilities under Project 1209 have been programmed for FY 83, 84 and 85, and are reflected in the resource line of this summary.

(3) (U) FY 1984 Planned Program: Upgrades for electromagnetic pulse testing of the EC-135 and E-4B are scheduled. Additional systems, including the F-18, MX, GLCM and B-52 Offensive Avionics System will be tested. Facility improvements which enhance test capabilities will continue. The requirement to test weapon system survivability in nuclear electromagnetic environments is continuing. The estimated costs are based on past program experience, adjustments for expected cost growth and the workload projected to support the above projects. This is a continuing program.

B. (U) Project: (2064 - HAVE NOTE): This program is for development, acquisition and baseline support of test facilities which simulate the nonnuclear electromagnetic environments in which weapon systems may be required to operate. The nonnuclear effort provides facilities for assessing the susceptibility of weapon systems to nonnuclear electromagnetic radiation. This radiation comes from hostile or friendly sources such as radios, radars, jammers, or other electronic devices. These sources can illuminate the weapon for lengthy periods of time such as when the weapon is enroute to the target. The principal nonnuclear test facility is the Electromagnetic Compatibility Analysis Facility, an anechoic chamber where air-launched weapons can be radiated by a variety of signals. The data collected during testing is also used to update test methods and acquisition specifications, design standards, and maintenance technical orders to insure that the weapon system is immune to those radio frequency emanations which it may encounter during its life cycle from stockpile to target. Weapon systems program offices arrange the testing time and provide test resources and test costs.

Program Element: #64747F
DOD Mission Area: #454 - Other Test & Evaluation Support

Title: Electromagnetic Radiation (EMR) Test Facilities
Budget Activity: #6 - Defense-wide Mission Support

(1) (U) FY 1982 Achievements: Testing of the Infrared Maverick, Sidewinder (AIM-9P) and Low Level Laser Guided Bomb was conducted. An electro-optical/infrared targeting system was installed in the anechoic chamber. An Automatic Data Acquisition and Control System is being developed to improved testing efficiency. Guidance on EMR hardening to system project offices continued.

(2) (U) FY 1983 Program: Testing of Wide Area Anti-Armor Munitions, Low Level Laser Guided Bomb and laser Guided Hard Structure Munitions is scheduled. Facility improvements which enhance test capabilities will continue.

(3) (U) FY 1984 Planned Program: Testing will be conducted on the Advanced Medium Range Air-to-Air Missile and Wide Area Anti-Armor Munitions. Facility improvements which enhance test capabilites will continue under both projects. The requirement to test weapon system survivability in nonnuclear electromagnetic environments is continuing. The estimate costs are based on past program experience, adjustments for expected cost growth and the workload projected to support the above projects. This is a continuing program.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #64755F
DOD Mission Area: #451 - Major Ranges and Test Facilities
Title: Improved Capability for DT&E
Budget Activity: #6 - Defense-wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual*	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	(23,513)	31,478	68,339	80,333	Continuing	Not Applicable
2870	Aeropropulsion Systems Test Facility (ASTF)	(2,189)	12,700	12,935	11,781	0	37,416
2871	Global Positioning System/ Time-Space Positioning Information (GPS/TSPI)	(400)	(1,600)+	3,830	9,138	24,061	37,029
2873	Integration Facility for Avionic Systems Testing (IFAST)	(5,078)	2,300	3,866	1,418	0	7,584
2874	Integrated Flight Data Processing System (IFDAPS)	(3,300)	4,500	10,563	8,020	0	23,083
2875	Advanced Range Data System (ARDS)	0	0	0	549	20,030	20,579
2876	Global Positioning System/ Sonobuoy Missile Impact Location System (GPS/SMILS)	(850)	2,000	1,906	1,009	1,825	6,740
2880	ARIA Upgrade	(4,880)	6,078	14,172	11,378	7,472	39,100
2911	Distant Object Instrumentation System	0	0	0	0	21,600	21,600
2959	Radar Target Scattering Facility (RATSCAT)	(2,400)	3,900	0	0	0	3,900
2960	Calibrated Airborne Spatial Measurement System (CASIMS)	0	0	2,873	0	0	2,873
6510	Flight Test Simulators	0	0**	18,194	37,040	Continuing	Not Applicable

* FY 82 Funding is in PE 65807F and is non-additive in this PE.
\+ FY 83 Funding is in PE 64735F and is non-additive in this PE.
** Transfered from PE 64735F as a zero balance transfer in FY 84 & 85.

Program Element: #64755F
DOD Mission Area: #451 - Major Ranges and Test Facilities

Title: Improved Capability for DT&E
Budget Activity: #6 - Defense-wide Mission Support

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for the engineering, development, acquisition and installation of significant new test range and instrumentation systems required for development, test and evaluation. The new systems are required to obtain adequate capability to test and evaluate weapon and support systems currently in development. This Program Element resulted from the need to improve management visibility for major improvement and modernization (I&M) projects at Air Force Research, Development, Test and Evaluation ranges/centers. OSD directed these programs, with applicable funding, be transferred from PE 65807F to PE 64755F effective in FY 1983. In addition to increasing visibility of range/center I&M efforts, this transfer also clarifies the funding needed to develop and acquire new or improved capabilities at the ranges/centers.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	(24,039)	46,478	59,423	0	86,200	192,101

Funding deltas between FY 84 submittal and FY 83 are as follows: FY 82 does not apply as funding was covered in PE 65807. FY 83 reflects the Congressional reduction as listed in the Dec 82 Continuing Resolution (subtracts $15,000). FY 84 changes are due to ASTF funding profile adjustments (subtracts $3,500), Air Force add for IFDAPS (adds $8,000), OSD reduction for IFDAPS (subtracts $6,000), inflation and unspecified adjustments (subtracts $2,301), OSD adjustment (subtracts $5,477) for offset and a zero balance transfer of project 6510 from PE 64735 (adds $18,194).

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands) - Not applicable.

5. (U) RELATED ACTIVITIES: The improvement and modernization program is directly related to the Test and Evaluation support (PE 65807F) Program. In addition, the improved capabilities benefit all system-test programs which come to the DT&E ranges/centers.

6. (U) WORK PERFORMED BY: The I&M projects contained in this Program Element are the responsibility of the applicable range/center commander and his staff. Major contractors performing work on these efforts are identified under the separate project descriptions.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: (2871 - Global Positioning System/Time-Space Positioning Information (GPS/TSPI)): The Tri-service GPS range applications study currently being conducted will provide the basis for a five-year GPS equipment development program for the test and training ranges. It is expected that a family of GPS range instrumentation will be developed. Western Space and Missile Center (WSMC) is lead organization for the current GPS applications study. The Analytical Sciences Corp (TASC) is providing technical support via a cost plus fixed fee contract. A competitive contract definition approach is planned for the development program. The application of GPS technology at the test and training ranges has the potential to improve Time Space and Position Information (TSPI) capabilities in terms of accuracy and coverage; reduce proliferation of range TSPI systems by using standardized GPS-based instrumentation; provide inter-range compatibility; and save an estimated $350 million in TSPI system development and range operating costs. FY 82 accomplishment was initiation of basic study reviews normally conducted during a conceptual phase. FY 83 will consist of continuation of the conceptual phase and development of the RFP. FY 84 will conclude the RFP activities with a planned contract award expected in the second quarter.

B. (U) Project: (2873 - Integration Facility for Avionics Systems Testing (IFAST): The IFAST is a three-story Avionics Test Facility which contains four program test areas and central support systems, including an automated data-processing complex. Lessons learned from the Development, Test and Evaluation (DT&E) programs at the Air Force Flight Test Center (AFFTC) proved the need for appropriate onsite avionics support facilities to implement "test-before-fly" techniques. Substantial savings are realized with IFAST. Reduces the number of tests and time required to adequately assess avionics systems performance. The test programs of the eighties do not permit costly "fly-fix-fly" test programs. The IFAST will be available to support all programs at the AFFTC; however, the design will be oriented to support programs with offensive, digital avionics. The design achieves maximum software capability with the Air Force Avionics Laboratory. FY 82 accomplishments include completion of the IFAST facility and purchase of the initial hardware required. FY 83 will be a continuation of the IFAST development effort. Facility (building) will be accepted. RFP for the B-1B site preparation work will be released with IOC for one test bay scheduled for 3rd quarter FY 83. FY 84 is to be a continuation of IFAST development consisting of in-plant development and on-site integration.

C. (U) Project: (2876 - Global Positioning System/Sonobuoy Missile Impact Location System (GPS/SMILS)): The GPS-SMILS program is developing a new impact scoring system to support ballistic missile testing. A major program objective is to reduce broad ocean scoring costs. GPS-SMILS will employ sonobuoys equipped with GPS translators, recording/processing equipment on board a 707 ARIA and a Post Mission Processor (PMP) at WSMC. The development contractor (Applied Physics Laboratory) will produce six prototype GPS buoys, three aircraft equipment sets, the PMP and specifications for the GPS buoys. It will provide an accurate, low cost broad ocean area (BOA) impact scoring system that can easily be relocated as needed to support ballistic missile programs such as Minuteman III, TRIDENT, and MX. GPS-SMILS will make possible an annual operating cost avoidance of at least $2.5M (1981$) by eliminating the need for ship support presently required by SMILS. Failure to develop an operational GPS-SMILS for BOA scoring will result in continued use of SMILS, with its associated high ship costs, ship scheduling problems, and targeting inflexibility. FY 82 was the period for system concept and study. FY 83 will be a continuation of the FY 82 effort with a concept demonstration in the 4th quarter. FY 84 will consist of a prototype demonstration in the 4th quarter.

D. (U) Project: (2960 - Calibrated Airborne Spatial Infrared Measurement System (CASIMS)): CASIMS is an airborne development testbed facility specifically equipped to support development experiments and testing of air-to-ground terminally guided weapons programs at Armament Division. System is housed in an aircraft and consists of a large stabilized deployable gimbal, control and display electronics, digital data handling systems, high density digital recorder systems and other analog and video data recording systems. Its purpose is to support the development process, to perform captive test experiments, and to support test programs associated with air-to-ground weapons, a test bed facility is required. This system will be used on multiple programs rather than having a unique airborne facility to support each program. Typical programs include LANTIRN, Airfield Damage Assessment, Battlefield Laser Implication program, Maverick, GBU-15, WASP, LLLGB and efforts such as GROUND TRUTH, CO_2 laser experiment, SEEKER ALGORITHM, and focal plane array technology. Funding for CASIMS was carried in PE 65807 through FY 83. Under that program it was referred to as the airborne seeker evaluation test system. FY 82 saw release of the RFP. FY 83 brought contract award. Funding in FY 84 was transferred to PE 64755 to complete the program and provide an IOC in late FY 84.

Program Element: #64755F Title: Improved Capability for DT&E
DOD Mission Area: #451 - Major Ranges and Test Facilities Budget Activity: #6 - Defense-wide Mission Support

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: (2870 - Aeropropulsion Systems Test Facility (ASTF))

A. (U) Project Decription: The Aeropropulsion Systems Test Facility (ASTF) was funded under the FY 1977 Military Construction Program. This facility will be a unique national test asset for integrated aerodynamic and propulsion testing of turbine engines. Facility construction is currently scheduled for completion in late FY 1984. Approximately fourteen months have been allocated after construction completion to perform facility checkout and initial systems testing and activation, of ASTF.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: This project was included as part of PE 65807. During FY 1982 basic construction and equipment installation of the project continued from past years efforts.

(2) (U) FY 1983 Program: Initial checkout test will be performed on the installed electrical systems and in the air supply and exhaust areas.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Hardware installation and checkout will continue. Checkout of test areas and initial build up in test cells for simulator testing will begin. All efforts will be conducted to meet an IOC of late FY 85. FY 84 funds requested are necessary to meet the IOC goal and provide an operational test facility to the RDT&E and acquisition community. The AEDC commander and his staff provide the overall planning, programming, budgeting and administration of all test facilities at Arnold AFS, TN. ARO, Inc is the operating contractor responsible for ASTF activation and initial operation.

(4) (U) Program to Completion: Final checkout and initial systems testing will be performed in FY 1985. The Initial Operational Capability (IOC) for ASTF is currently projected for late FY 1985. After IOC, ASTF operation and maintenance will be funded within Program Element 65807F.

C. (U) Major Milestones:

Milestones	Dates
Construction Completion	July 1984
Initial Operational Capability	Sept 1985

9. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Project: (2874 - Integrated Flight Data Processing System (IFDAPS))

Program Element: #64755F | Title: Improved Capability for DT&E
DOD Mission Area: #451 - Major Ranges and Test Facilities | Budget Activity: #6 - Defense-wide Mission Support

A. (U) Project Description: Provides a single integrated system which modernizes Flight Test Data-Processing capabilities. It provides an engineering-unit data-processing capability to meet critical real-time and quick-look data needs, and reduces turnaround time for post-flight data. The current system is saturated, and reaching the end of its useful life.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments (PE 65807F): System Design Review and Preliminary Design Review were completed. Work began on critical design phase.

(2) (U) FY 83 Program: Work will continue on critical design phase, with CDR scheduled in Feb 83. Product Specification Development is in process, with delivery expected for Jan 83. Hardware deliveries are scheduled for Oct - Nov 83 to the contractor facility.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: In-plant development will continue in FY 84 to meet an IOC of late FY 1984. On-site development will continue after IOC into FY 1985 with FOC scheduled for that year. FY 1984 funds requested are required to complete the work necessary to meet the IOC.

(4) (U) Program to Completion: On-site development is to continue for an FOC of late FY 1985. O&M and support of the IFDAPS will be funded from PE 65807 once on line in FY 1984.

C. (U) Major Milestones:

Milestones	Dates
Contract Award	Sept - Oct 82
Design Complete	Sept 83
Inplant Development Complete	Sept 84
IOC at AFFTC	Sept 84
On-site Development Complete	July 85
FOC	July 85

10. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Projects: (2880 - Advanced Range Instrumentation Aircraft (ARIA) Upgrade)

A. (U) Project Description: The ARIA Upgrade project consists of tasks that contribute to the enhancement of ARIA capabilities. These ARIA tasks are the 707 Conversion, Receiver Upgrade, Sonobuoy Missile Impact Location System (SMILS), Digital Upgrade, Signal Sources, Spectrum Analyzers, and other ARIA efforts each under $25K/unit.

Program Element: #64755F
DOD Mission Area: #451 - Major Ranges and Test Facilities

Title: Improved Capability for DT&E
Budget Activity: #6 - Defense-wide Mission Support

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Not applicable, efforts funded under PE 65807F thru FY 1982. Upgrade project zero balance transferred in FY 1983 to PE 64755.

(2) (U) FY 1983 Program: First of the C-18 (Boeing 707 aircraft) will be ARIA configured. This is an ongoing effort over the next several years. The Statement of Work for GPS/SMILS will be developed. New ARIA receivers are to be delivered to meet telemetry data gathering requirement.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: First C-18 will be delivered in Sept 84. Acquisition of Spectrum Analyzers, Signal Sources, and other ARIA related hardware will be completed to provide uninterrupted completion of the upgrade program. Funds requested will cover the above efforts and provide the 4950th Test Wing with instrumented aircraft required to meet the mission goals.

(4) (U) Program to Completion: Work will continue on C-18 (Boeing 707) ARIA conversion and upgrades through FY 1988.

C. (U) Major Milestones:

Milestones	Dates
ARIA Aircraft #1 FOC	Oct 84
ARIA Aircraft #2 FOC	Sep 85
ARIA Aircraft #3 FOC	Sep 85
ARIA Aircraft #4 FOC	Jun 87
ARIA Aircraft #5 FOC	Jun 88
ARIA Aircraft #6 FOC	Jul 88

11. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Projects: (6510 - Flight Test Simulators)

A. (U) Project Description: There is a continuing and expanding need to flight test and evaluate new and/or modified electronic warfare (EW) equipment to counter new Soviet defensive systems prior to a production decision. These tests must be conducted in a simulated threat environment and require many threat radars. In the past, the adaptability of airborne ECM systems was quite limited. However, new Radar Warning Receiver (RWR) signal processing schemes are highly adaptive and make it extremely difficult to construct a test for such equipment without a large number of instrumented threat systems. This project was transferred from PE 64735F, Range Improvement, to consolidate Development, Test & Evaluation hardware developments.

Program Element: #64755F

DOD Mission Area: #451 - Major Ranges and Test Facilities

Title: Improved Capability for DT&E

Budget Activity: #6 - Defense-wide Mission Support

B. Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Not applicable, efforts funded under PE 64735F.

(2) (U) FY 1983 Program: Not applicable, efforts funded under PE 64735F.

(3) FY 1984 Planned Program and FY 1984 RDT&E Request: Continue work from PE 64735F on the SADS VIII, and SADS-XI [ ] New development starts include the SARS VI [ ] Look Down, Shoot Down Airborne intercept Radars. Accelerates work on the SADS-X [ ]

(4) (U) Project to Completion: This is a continuing project.

C. (U) Major Milestones: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 65101F Title: Project AIR FORCE
DOD Mission Area: 440, Technical Integration/Studies and Analyses Budget Activity: 6, Defense-Wide Management & Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	14,848	16,231	16,629	17,027	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Project AIR FORCE is a level of effort program decision-making capability for the Air Force through the creation and application of modern analytic methods. The work focuses on the future roles of air forces with emphasis on the issues which will influence decisions in the 1980's and beyond. New research efforts during FY 1984 will primarily reflect USAF interests in such issues as integrated national security strategy development, strategic force sustainability, wartime readiness assessment, future tactical force requirements and improved system acquisition and support. A manning level of 150 Members of the Technical Staff (MTS) was approved by OUSDR&E and supported by Congress in 1976; however, inflation reduced the effort to 137 MTS by FY 81. In FY 81 and FY 82 respectively, senior Air Force leadership indicated strong support for the program and added additional funds, through appropriate reprogramming actions, to insure that critical issues were analyzed adequately. These additional efforts were within the scope of research best accomplished under Project AIR FORCE and within the 150 MTS level of effort approved in 1976.

3. (U) COMPARISION WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	13,748	16,231	16,954		Continuing	Not Applicable

FY 1982: Increased funding was necessary to ensure a viable program that encompassed critical issues; hence additional funds were reprogrammed to bring the level of effort to approximately 145 MTS.

FY 1984: Difference is the result of inflation adjustments.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

5. (U) RELATED ACTIVITIES: Project AIR FORCE studies and analyses are conducted to assist Air Force senior managers in the decision-making process. The efforts span functional and organizational boundaries and often result in broad

Program Element: # 65101F Title: Project AIR FORCE
DOD Mission Area: 440, Technical Integration/Studies and Analyses Budget Activity: 6, Defense-Wide Management Support

recommendations concerning overall future Air Force actions. As a result, the research conducted under this program relates to a wide spectrum of activities in the Air Force. To assure relevance and to prevent unnecessary duplication of effort, each newly proposed research effort is reviewed by a cross-functional group of senior officers and by the Air Force Assistant Chief of Staff for Studies and Analyses; in addition, the results are published and deposited with the Defense Technical Information Center for appropriate dissemination to other qualified recipients.

6. (U) WORK PERFORMED BY: The senior Air Staff Group established to review, monitor and approv e research effort is chaired by the Deputy Chief of Staff for Research, Development and Acquisition. The Director perational Requirements, DCS/Research, Development and Acquisition, Headquarters USAF, is the Executive Agen d is responsible for the administration of the Project. All work is performed by The Rand Corporation, Santa Moni alifornia.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

(U) Projects: Numerous Projects.

A. (U) Project Description:

Approximately 50 research projects are in various stages of implementation during the course of each FY. All projects are initiated, processed and approved in accordance with AFR 20-9 which directs senior Air Force leadership and involvement on a continuing basis.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: A list of key Air Force issues was formulated and prioritized and used as a basis for directed research efforts. Each project was and will continue to be carefully tailored to cut across the full spectrum of these issues within manpower limitations and capabilities. Program areas were addressed as follows:

National Security Strategies: Research efforts concentrated on questions and issues of nuclear deterrence, the development of leverage strategy in Southwest Asia and the effects of Third World conflicts and terrorism on U.S. National Security.

Force Employment: This research program investigated chemical and directed energy weapon perspectives, force deployment to critical global areas and adversary vulnerabilities and capabilities.

Program Element: # 65101F | Title: Project AIR FORCE
DOD Mission Area: 440, Technical Integration/Studies and Analyses | Budget Activity: 6, Defense-Wide Management Support

Technology Applications Programs: Advanced Technologies with significant potential for Air Force application continue to be explored. Of significant note is the area of high energy, non-nuclear weaponry that may contribute directly to the acquisition of future Air Force weapon systems.

Resource Management: This program continues to provide insight into logistic's management problems and is contributing to the enhancement of efforts to support USAF forces in theater warfare. Coupled with research efforts in manpower and systems acquisition management, this program is producing meaningful results which may help the Air Force to address complex issues in a broader and more structured manner rather than focusing in more narrow terms which could lead to erroneous results.

(2) (U) FY 1983 Program: This research effort of approximately 143 MTS will continue to address key areas on top of the priority list of Air Force management. Specific study efforts will build from past research and will continue to focus on strategic issues and management policies which would enable the Air Force to sustain and deploy strategic and tactical forces. The overall program will continue to be directed by a board of general officers who will insure that the highest priority issues are addressed adequately. The requirement for essential research continue to outpace funding limitations; therefore, only those projects not duplicated elsewhere and of critical importance to the Air Force will be included in the program while remaining within the approved level of 150 MTS.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The program will evolve from FY 1983 under careful guidance and planning of the Air Force Advisory Group. The work will be closely aligned with many issues of critical importance to the Air Force, ranging from the sustainability of U.S. strategic forces to the effective utilization of human resources. The research will continue to be conducted through a program designed to provide both the intellectual focus for broad areas of inquiry and the identification and effective exploitation of new technologies that will enhance the Air Force's ability to meet assigned military objectives, improve combat capabilities and accomplish its overall mission. The requested funds will support an MTS level of 140 MTS, based on the latest contractor cost estimates. The Air Force will continue to focus these limited research efforts to critical issues and manage the program in accordance with AFR 20-9 and within the context of Congressional direction and intent.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #65304F
DOD Mission Area: #471 - Command Management Support

Title: Acquisition and Command Support Telecommunications and General Support
Budget Activity: #6 - Defense-wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	6,438	4,764	5,945	5,658	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Provides essential communication services to: Headquarters, Air Force Systems Command (AFSC); Aerospace Medical Division (AMD); Aeronautical Systems Division (ASD); Electronic Systems Division (ESD); Space Division (SD); Ballistic Missile Office (BMO); and the Armament Division (AD). This includes switchboards at ESD and SD; local tielines; equipment rentals; mobile radios for command/disaster control/ security police; and official toll calls and AFSC postage. This request includes the use of approved inflation rates and additional communications requirements for the new Defense Metropolitan Area Telephone System (DMATS) at ESD and the increases in telephone bills and postage rates.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	4,682	4,764	5,034	---	Continuing	N/A

FY 82: $1,756 was reprogrammed into this Program Element (PE) to compensate for increased telephone bills which were higher than forecasted due to inflation and commercial rate increases.

FY 83: Anticipate that additional dollars must be reprogrammed to pay these same increased telephone charges in FY 83.

FY 84 to Completion: This is a continuing program. Funding estimate increase is due to approved and anticipated telephone rate increases, added overhead cost for the Defense Metropolitan Area Telephone System at ESD (previously paid by a different PE), and increases in postal charges.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands): Not applicable.

5. (U) RELATED ACTIVITIES: This program element is in direct support of the Acquisition and Command Support (ACS) PE 65806F.

6. (U) WORK PERFORMED BY: American Telephone Company, New York, NY; RCA Corporation, New York, NY; Western Union Corporation, Mohwah, NJ; New England Telephone and Telegraph Company, Boston, MA; other communications carriers and communications companies.

Program Element: #65304F
DOD Mission Area: #471 - Command Management Support

Title: Acquisition and Command Support Telecommunications and General Support
Budget Activity: #6 - Defense-wide Mission Support

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Project: This is a continuing program.

B. (U) Project: This program continues funding for leased communication lines, switchboards and associated equipment required to carry-out the AFSC mission. Other requirements include: non-tactical radios, AFSC postage and franked envelop printing charges, and implementation of the Advanced Management and Information System and AFSC network systems.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #65306F
DOD Mission Area: #440 - Technical Integration/Studies and Analyses

Title: Ranch Hand II Epidemiology Study
Budget Activity: #6 - Defense Wide Management and Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	7,385	840	5,025	742	22,268	36,100

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The study is required to determine long-term health effects of exposure of Air Force (Ranch Hand) personnel and veterans to Herbicide Orange in Vietnam. This program was directed by the White House through a 16 September 1980 memo from Mr. Eizenstat, Assistant to President Carter for Domestic Affairs and Policy, to Secretary Brown. On 27 March 1981 the Office of Management and Budget approved the questionnaire and confirmed the new administration's desire to continue the study as directed. The Air Force Ranch Hand personnel are the only population whose frequency and duration of exposure to the herbicide are known with any accuracy.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

3,885	840	5,234		26,141	36,100

FY 82 Funding Differences: The original program schedule provided for the initial questionnaire administration and conduct of the physical examinations over a two year period at a cost of $9.1M (5.1M in FY 81 and 4.0M in FY 82). Office of Management and Budget's approval of the questionnaire and confirmation of the new administration's desire to continue the study as directed by the previous administration delayed the program start approximately 1 year. To meet previous public commitments to the Congress and the White House the program was compressed into 1 year (FY 82). Only $1.6M was required and requested in FY 81, thus the remaining $3.5M was now required in FY 82. $3.1M was reprogrammed into the FY 82 program.

Other Minor Funding Differences: Revised inflation indices and estimated salary increases.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands): None

Program Element: #65306F
DOD Mission Area: #440 - Technical Integration/Studies and Analyses

Title: Ranch Hand II Epidemiology Study
Budget Activity: #6 - Defense Wide Management and Support

5. (U) RELATED ACTIVITIES: This is only one of several Federal studies designed to provide information regarding alleged claims of adverse health effects from Vietnam veterans exposed to Herbicide Orange. These studies, including the Air Force study and the Center for Disease Control birth defects study are being coordinated by an Interagency Working Group, established by the White House, which has program review authority and could require certain changes that would impact funding, scheduling or both.

6. (U) WORK PERFORMED BY: This program is being conducted by the Aerospace Medical Division through the United States Air Force School of Aerospace Medicine, Brooks Air Force Base, TX. Contractors include the National Opinion Research Center, NY, NY (questionnaire development), Louis Harris and Associates NY, NY (questionnaire administration) and Kelsey-Sebold Houston, TX (physical examinations). It should be noted that contracts for the follow-up phase scheduled for FY 84 will be rebid and different contractors may be selected.

7. (U) SINGLE PROJECT LESS THAN $10 MILLION IN FY 1984:

(U) Project: 2767, Ranch Hand II Epidemiology Study

A. Project Description: The purpose of this investigation is to determine whether long-term health effects exist and can be attributed to occupational exposure to Herbicide Orange. The extensive use of herbicides in Vietnam between 1962 and 1970 was terminated when it became known that a contaminant, tetrachlorodibenzo-P-dioxin (dioxin), was present in the herbicides and that this contaminant caused congential abnormalities when administered to pregnant rodents. Subsequent extensive research into the toxicity of dioxin in animals remains equivocal. The scientific literature on the toxicity of the components of Herbicide Orange reveals that the two main ingredients have extremely low toxicity, distinctly different from the contaminant dioxin. Only recently have comprehensive prospective studies in humans been undertaken. Past sutdies have only validated a link between dioxin exposure and subsequent development of acne type skin disease. Air Force personnel involved with aerial herbicide missions in Vietnam (Ranch Hand) were potentially at greater risk; therefore, an epidemiological investigation of these personnel should elicit any adverse effects, if they exist. This is potentially a 20-year program involving a comparison of Ranch Hand personnel to other crew members and support personnel serving in Vietnam, who were not exposed to herbicides for mortality rates, present and past health status, and future follow-up health status at 3-, 5-, 10-, 15- and 20-year periods.

B. (U) Program Accomplishments and Future Efforts

(1) (U) FY 1982 Accomplishments: Questionnaire administration and initial physical examinations were completed. Preliminary mortality data has been analyzed and crude mortality rates determined.

(2) (U) FY 1983 Program: Involves analysis of physical examination/questionnaire data, continuation of the mortality study and detailed analysis of current mortality data, release of initial mortality and health status data, continuation of project data base management and adaptive changes to questionnaire/physical examinations based on initial study results.

Program Element: #65306F
DOD Mission Area: #440 - Technical Integration/Studies and Analyses

Title: Ranch Hand II Epidemiology Study
Budget Activity: #6 - Defense Wide Management and Support

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The FY 84 program is the first follow-up phase consisting of administration of questionnaires and conduct of physical examinations as adapted for use in follow-up health status determinations.

(4) (U) Program to Completion: This is a continuing cyclic program with follow-up health status and mortality rate determinations at the remaining 5-, 10-, 15-, and 20-year time periods. Data analysis, data releases and adaptive changes to questionnaire or physical examination will occur in the intervening time periods.

C. (U) Major Milestones: Not applicable.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 65708F — Title: Aircraft Navigation System Verification
DOD Mission Area: #451 - Master Range & Test Facilities — Budget Activity: #6 - Defense-wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	1,694	15,590	38,704	18,264	Continuing	Not Applicable
2900	RATSCAT Upgrade	0*	2,000	23,400	2,000	Continuing	Not Applicable
688G	A/C Navigation System Verification	1,694	1,800	1,900	1,900	Continuing	Not Applicable
06TG	6585th Test Group Support	0*	11,790	13,404	14,364	Continuing	Not Applicable

* Funded under PE 65807. Program was zero fund transferred to PE 65708 in FY 83.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Through FY 82, this program element provided for standardized verification of aircraft inertial and inertially aided navigation systems prior to their consideration for use by DOD agencies. These evaluations were conducted at the Central Inertial Guidance Test Facility (CIGTF). Beginning in FY 83, several associated efforts which were previously accomplished in Program Element 65807F were consolidated within this program element to provide better management visibility of the 6585th Test Group activities. These efforts include the High Speed Sled Track, the Radar Target Scattering (RATSCAT) Facility, and the 6585th Test Squadron. The consolidated program provides DOD with single point visibility of these critical test efforts needed to insure the candidate systems work as intended before they enter production.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

Aircraft Navigation System Verification	1,694	15,590	18,095	----	Continuing	Not Applicable

FY 82: No change; FY 83: No change, however $438 will be reprogrammed into this program element during FY 83 to fund the 1 Oct 82 civilian pay raise, the pay cap increase and the increased cost of civilian health care and medicare benefits; FY 84: Increase represents funding necessary for a major upgrade to the RATSCAT facility (adds $21,400) and various other programmatic and unspecified adjustments (subtracts $791).

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands) - Not Applicable.

5. (U) RELATED ACTIVITIES: Project 688G at CIGTF provides development and support funds for the Completely Integrated Reference Instrumentation System (CIRIS) and the Airborne Reference Instrumentation System (ARIS). These facilities are available to all military services, other qualified governmental agencies and qualifying industries from the private

sector on a reimbursement basis.

6. (U) WORK PERFORMED BY: Overall planning, programming, contracting and associated funding support are provided by the Armament Division (AD), Eglin AFB, FL. The 6585th Test Group manages daily activities. The primary contractor, Dynalectron of Washington, D.C., operates and maintains the RATSCAT facility. CIGTF and High Speed Sled Track facilities are operated primarily with government employees.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

(U) Project: (688G - Aircraft Navigation System): Project No. 688G, Aircraft Navigation System Verification, provides for standardized tests and subsequent evaluations of inertial and inertially-aided aircraft navigation systems by AFSC at the CIGTF. During the 1980s requirements for testing of advanced aircraft navigation and weapon delivery avionics systems for DOD weapon systems will continue. Project 688G will provide common support for these efforts with a Completely Integrated Reference Instrumentation System (CIRIS) capability. Tasks undertaken by this project include, Inertial Navigation System (INS) Verification Testing, Aided INS Verification Testing, Velocity Sensor Verification Testing, standard INS Qualification Testing, management of the Completely Integrated Reference Instrumentation System (CIRIS), and minor I&M of the systems as required to support both the project efforts and users with valid support requirements. These goals were met in FY 82 with support provided to MX and TRIDENT. FY 83 and 84 is expected to be a continuation of such support to B-1B, Army BMD, and Navy.

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: (2900 RATSCAT Upgrade):

A. (U) Project Description: The Radar Target Scatter (RATSCAT) Facility is a unique outdoor electromagnetic laboratory facility which performs tests to obtain antenna patterns and radar cross-section measurements. These tests will provide essential radar characteristics data to DOD and government sponsored programs. Measurements have been performed for the B-1B aircraft and advanced weapon designs. A majority of the RATSCAT workload has programmatic drivers. Majority of programs are low radar cross/section weapon systems which require the special support the RATSCAT system can provide. Studies low observable technology.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: FY 82 funding provide minor I&M upgrade efforts to the RATSCAT facility. Areas of improvement included such things as new recorders, antennas with improved characteristics etc.

(2) (U) FY 1983 Program: FY 83 will be a continuation of this type of activity.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: FY 84 is programmed as a continued activity and will also be a period to start planning for an update of the RATSCAT advanced measurement site. The minor I&M efforts addressed in this PE are to be a continuing effort. Further update activities will be accelerated to meet special

needs of users with programs requiring the special capabilities of RATSCAT.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

9. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: (06TG - 6585th Test Group Support)

A. (U) Project Description: The 6585th Test Group is a tenant organization at Holloman AFB, NM. Holloman AFB is located near Alamogordo, NM adjacent to the White Sands Missile Range. Although organizationally assigned to the Armament Division, Eglin AFB, FL, the activities of the 6585th Test Group were removed from Program Element 65807F in FY 83 and consolidated in this Program Element to afford them greater management visibility and control. Previously, Program Element 65708F included only navigation system verification. Consolidation of efforts under Program Element 65708F combined institutional funding of operations, maintenance, improvement, modernization and personnel for the three major facilities within the 6585th Test Group. The High Speed Test Track performs rocket sled testing of missile guidance, aircraft ejection systems, performance measurements of the MX guidance system under environmental stress conditions, and recently attained a new world speed record of over Mach 8 while testing rain erosion degradation of reentry vehicle shapes. The Central Inertial Guidance Test Facility (CIGTF) has responsibility for conducting standardized tests of navigation systems for all DOD aircraft. Typical test programs include inertial navigation systems for the MX and TRIDENT missile systems, ring laser gyroscope development, and gravitational measurements necessary for ballistic missile guidance. The data from these tests provide DOD with a common baseline to evaluate the performance of navigation systems. Project 688G provides development and support funds for the Completely Integrated Reference Instrumentation System (CIRIS) and the Airborne Reference Instrumentation System (ARIS). The RATSCAT facility is operated and maintained by contract with Dynaelectron. The CIGTF and High Speed Sled Track facilities are primarily operated with government employees. The 6585th Test Group provides airspace management and liaison for USAF testing at the Army's White Sands Missile Range. The Armament Division provides overall planning, programming, contracting, and management support to the 6585th Test Group.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: 6585th Test Group provided services to the RATSCAT, CIGTF, and High Speed Track facilities. Funding was used to: operate, maintain and upgrade facilities; conduct and support testing in the areas of inertial navigation systems, high speed sled track simulations, and antenna and radar backscatter measurement; support flight test operations of AD Det 1; and provide liaison support to the White Sands Missile Range (WSMR). Major programs which were supported include: MX and TRIDENT guidance systems, ACES II ejection system, Ring Laser Gyro Navigator, B-1B radar cross-section measurement, and PAVE MOVER. During FY 82, these efforts were funded in Program Element 65807F.

(2) (U) FY 1983 Program: 6585th Test Group funding will continue: operation, maintenance, and modernization

Program Element: # 65708F Title: Aircraft Navigation System Verification
DOD Mission Area: #451 - Master Range & Test Facilities Budget Activity: #6 - Defense-wide Mission Support

efforts at all facilities; the test and evaluation mission; and support of WSMR. Major programs which will be supported include: High Accuracy Ring Laser Inertial Navigation System; ACES II Ejection System, MX and TRIDENT Guidance Systems, and USAF directed programs. Beginning in FY 83, support of all 6585th Test Group activities previously funded in Program Element 65807F were transferred to this Program Element.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Many of the prior year programs will continue. These will include: MX and TRIDENT Guidance Systems, ACES II and B-1B Ejection Systems, and USAF directed programs. New programs will include: Next Generation Trainer (NGT) Ejection System, Weapons Airframe Technology, and Solid Fuel Ramjet. Funds requested will provide resources necessary to meet the support requirements programmed for FY 84.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #65806F
DOD Mission Area: #471 - General Management Support

Title: Acquisition and Command Support
Budget Activity: #6 - Defense-wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	267,217	279,000	303,430	318,281	Continuing	Not Applicable
	HQ, Air Force Systems Command* (AFSC) Support Squadrons	10,387	10,435	11,285	12,000	Continuing	Not Applicable
	Aeronautical Systems Division*	111,587	116,269	124,517	126,000	Continuing	Not Applicable
	Electronic Systems Division* (ESD)	58,199	59,109	64,452	67,222	Continuing	Not Applicable
	Aerospace Medical Division* (AMD)	13,502	16,341	18,477	22,722	Continuing	Not Applicable
	Space Division (SD)*	41,670	44,454	47,500	50,322	Continuing	Not Applicable
	Armament Division (AD)*	24,029	23,852	27,521	29,715	Continuing	Not Applicable
	Ballistic Missile Office (BMO)	7,843	8,540	9,678	10,300	Continuing	Not Applicable

*The Management Headquarters function at the AFSC Product Divisions (ASD, ESD, AMD, AD and SD) were transferred into PE 65898F beginning in FY 83.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Acquisition and Command Support (ACS) provides the resources to support the various staff functions, the technical mission, and support activities at each of the organizations listed above. Categories of cost include civilian pay and the related costs of civilian personnel, travel, transportation, rents, utilities, contractual services, supplies, and equipment. Provides resources for the operation and maintenance of Hanscom AFB, MA, Brooks AFB, TX, Los Angeles AFS, CA, and Ft MacArthur, CA.

3. (U) COMPARISON WITH FY 198 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	241,702	269,229	274,306	Continuing	Not Applicable

Increases over the FY 83 descriptive summary pricing are due to the following:

FY 82 - Reflects the reprogramming actions taken for the 1 Oct 81 civilian pay raise (adds $10,185) and other unfunded requirements (adds $5,000) and the management headquarters adjustment to PE 65898F (adds $10,330).

FY 83 - Reflects a programmatic adjustment (subtracts $2,229) and includes a reprogramming action submitted concurrently with the FY 84 President's Budget (adds $12,000) to provide increased funding to operate Ft MacArthur, CA; to repair steamlines at Hanscom AFB, MA; to pay utility rate increases charged by the San Antonio Real Property Maintenance Agency (SARPMA); and to pay civilian personnel salaries at currently authorized manning levels. An additional $12,374 will be reprogrammed into this program for civilian health care benefits, the 1 Oct 82 pay raise and pay cap adjustment.

FY 84 - Provides for the 1 Oct 82 civilian pay raise (adds $9,440) and the Government's portion of the civilian employee health care and medicare payments (adds $3,734). Includes programmatic growth (adds $3,950) to fund new program efforts (such as B1-B, HH-60D, C-17, C-5B and Air Base Survivability); a Space Division (SD) secretarial pay increase; and a new funding requirement to support travel for non-AFSC personnel who travel in support of AFSC managed procurement programs. Additional funds are included (adds $12,000) to operate Ft MacArthur, CA; to continue repair of Hanscom AFB, MA steamlines to pay fact-of-life utility and base support rate increases charged by the San Antonio Real Property Maintenance Agency (SARPMA); and to continue to pay civilian personnel at authorized manning levels.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands) - Not applicable.

5. (U) RELATED ACTIVITIES: Funding for the Commander's Management Staff for each of the AFSC Product Divisions (ASD, ESD, AMD, SD, and AD) is included in Program Element (PE) 65898F - Management Headquarters Research and Development. Communications support is included in PE 65304F - ACS Telecon. Audiovisual support is included in PE 65890F - Audiovisual.

6. (U) WORK PERFORMED BY:
Major Contractors:
Washington Patrol Services, Inc., Escondido, CA
Metro Boston Contracting Co., Cambridge, MA
Multi-Service Maintenance, Boston, MA
Trend Western Technical Corp., Los Angeles, CA
Del-Jen, Inc., Los Angeles, CA

There are approximately 255 additional contractors that support one or more of the seven listed Air Force Systems Command activities. Total value of all contracts is $17.8M.

Air Force Activities:
Aeronautical Systems Division, Wright-Patterson AFB, OH - responsible for management of aeronautical systems acquisition.
Electronic Systems Division, Hanscom AFB MD - responsible for command, control, and communications systems
Aerospace Medical Division, Brooks AFB, TX - provides biomedical support for aerospace systems
Space Division, Los Angeles AFS, CA - plans, programs, and manages space systems
Armament Division's Deputy Commander for Development and Acquisition, (AD/CZ), Armament Division, Eglin AFB, FL - manages the development, production, and validation of non-nuclear air armament systems
Ballistic Missile Office, Norton AFB, CA - plans, programs and manages the DOD ballistic missile programs

Program Element: #65806F
DOD Mission Area: #471 - General Management Support

Title: Acquisition and Command Support
Budget Activity: #6 - Defense-wide Mission Support

HQ AFSC Activities, various locations - provides support to HQ AFSC
Ft MacArthur, CA - provides a living community for military personnel assigned to Los Angeles AFS, CA (Funding is provided thru Space Division.)

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Ballistic Missile Office (BMO)

B. (U) BMO plans, programs, and manages systems programs to acquire ballistic missile systems, Aerospace Ground Equipment, and other subsystems and related hardware; provides for the activation/alteration of missile sites and ground launch facilities. Conducts and manages standardization, compatibility, personnel subsystems, reliability and maintainability, configuration management, survivability and vulnerability, systems engineering, value engineering, and quality assurance programs, related to missile systems, equipment and material. Acquires and manages industrial facilities. Prepares, completes, and coordinates program management plans, to include management arrangements with other elements of Air Force Systems Command, United States Air Force, Department of Defense agencies, other military departments, other US Government agencies and industry. Ensures efficient and effective logistic support of systems and equipment being developed for the operational inventory, and discharges USAF responsibility as Manager of the DOD Advanced Missile Reentry Systems program. BMO has responsibility for the Minuteman and Peacekeeper Program Offices. This is a continuing mission support program with funding increases attributed to inflation and programmatic increases to support new programs such as MX.

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

A. (U) HQ Air Force Systems Command Support Squadrons: The mission of AFSC is to advance aerospace science and technology, apply it to aerospace systems development and improvement, and to acquire the qualitatively superior aerospace systems and equipment needed to accomplish the Air Force mission. The following squadron organizations funded from this program element provide support to AFSC: 6591st Computer Services Squadron, provides data automation services to HQ AFSC; 6592nd Management Engineering Squadron, provides AFSC field commands with base level manpower and organizational services which include developing and maintaining manpower standards; 6593rd Field Printing Squadron provides composition, lithograph, duplicating, printing and bindery services for HQ AFSC, and other assigned units. This program funds for the pay and related costs of civilian personnel, travel, transportation, rents, contractual services, supplies and equipment for these three squadron organizations.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 and Prior Accomplishments: Not Applicable. This is a continuing program.

(2) (U) FY 1983 Program: This is an in-house effort by the organizations cited above which support many program elements and projects in the Research, Development, Test and Evaluation community, and associated procurement programs.

(3) (U) FY 1984 Planned Program: This is a level of effort program, the main cost of which (87%) is for pay of civilian personnel. Increase is for civilian pay raise and inflation.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

9. (U) PROJECT OVER $10 MILLION IN FY 1984:

A. (U) Aeronautical Systems Division: ASD manages acquisition of aeronautical systems, subsystems, and related equipment programs and projects until transfer of responsibility to Air Force Logistics Command (AFLC); accomplishes systems engineering and technical direction to designated programs and provides general engineering support in applicable disciplines; exercises overall responsibility for Development, Test and Evaluation (DT&E) for assigned advanced and engineering development programs; and exploits exploratory and advanced development products, including foreign technology. ASD has responsibility for approximately 250 programs, including major programs such as the B-1, F-16, and F-15.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 and Prior Accomplishments: Not Applicable. This is a continuing program.

(2) (U) FY 1983 Program: This is an in-house effort by the organization cited above which supports many program elements and projects in the Research, Development, Test and Evaluation community, and associated procurement programs.

(3) (U) FY 1984 Planned Program: This is a continuing program, the main cost of which (89%) is for pay of civilian personnel. Increase is for civilian pay raise, inflation, and additional program efforts on the programs such as, C-17, C5B, HH-60D, Tanker Transport Bomber (TTB) Trainer, Next Generation Trainer (NGT), Precision Location Strike System (PLSS).

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

10. (U) PROJECT OVER $10 MILLION IN FY 1984:

A. (U) Electronic Systems Division: ESD plans and manages the acquisition and related engineering development of command, control and communications, and intelligence electronic systems, subsystems, and equipment; plans and conducts research and exploratory and advanced development programs in areas of information sciences, intelligence for command, control and communications; accomplishes assigned engineering development; exploits exploratory and advanced development products, including foreign technology; manages the operations of the Electromagnetic Compatibility Analysis Center; and

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manages assigned Foreign Military Sales (FMS) programs. ESD has responsibility for approximately 25 Program Offices and major programs such as Traffic Control Approach and Landing System, Airborne Warning and Control System (AWACS), Over the Horizon Radars, Advanced Airborne Command Post, and Joint Tactical Information Distribution System (JTIDS). ESD operates Hanscom AFB, MA and is responsible for all support, operational, and maintenance requirements at this major facility.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 and Prior Accomplishments: Not applicable. This is a continuing program.

(2) (U) FY 1983 Program: This is an in-house effort by the organization cited above which supports many program elements and projects in the Research, Development, Test and Evaluation community, and associated procurement programs.

(3) (U) FY 1984 Planned Program: This is a level of effort program, the main cost of which (66%) is for pay of civilian personnel. Program includes an increase to continue a major steam line repair/replacement project, fund the 1 Oct 82 civilian pay raise, and compensate for inflation.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

11. (U) PROJECT OVER $10 MILLION IN FY 1984:

A. (U) Aerospace Medical Division: AMD plans, performs, and manages the Air Force Systems Command (AFSC) exploratory, advanced, and engineering development programs to provide biomedical support for aerospace systems; advance aerospace biotechnology; determine the personnel hazards of aerospace environments and establish the associated human tolerances; extend human capabilities and enhance integration of man in weapon systems; provide biomedical support for personnel subsystems; improve Air Force health services; and provide technical and/or management assistance in these areas to support studies, analyses, development planning, acquisition, test, evaluation, modification and/or operation of aerospace systems and related equipment. AMD's 6570th Air Base Group operates and maintains Brooks AFB, TX, and provides support to various AMD organizations such as the Air Force School of Aerospace Medicine and Wilford Hall USAF Medical Center.

B. (U) Program Accomplishments and Future Programs:

(1) (U) FY 1982 and Prior Accomplishments: Not applicable.

(2) (U) FY 1983 Program: This is an in-house effort by the organization cited above which supports many program elements and projects in the Research, Development, Test and Evaluation community, and associated procurement programs.

(3) (U) FY 1984 Planned Program: This is a level of effort program, the main cost of which is for pay of personnel and the purchase of base civil engineering services and utilities from the San Antonio Real Property Maintenance Agency (SARPMA) industrial fund. Increase is for civilian pay raise, inflation, and SARPMA rate increases.

Program Element: #65806F Title: Acquisition and Command Support
DOD Mission Area: #471 - General Management Support Budget Activity: #6 - Defense-wide Mission Support

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

12. (U) PROJECT OVER $10 MILLION IN FY 1984:

A. (U) Space Division: SD plans, programs, and manages system programs to acquire space and missile systems, Aerospace Ground Equipment and related hardware. Provides for the activation and alteration of ground launch facilities; performs the functions of launch, on orbit tracking, data acquisition, and command and control of Department of Defense (DOD) satellites. Conducts and manages standardization, environmental engineering, systems safety engineering, electomagnetic compatibility, personnel subsystems, reliability and maintainability, configuration management, survivability and vulnerability systems engineering and value engineering programs. Prepares and coordinates program management plans with other elements of Air Force Systems Command, United States Air Force, DOD agencies, military departments and government agencies Participates in research and development, procurement and production programs established with the North Atlantic Treaty Organization. Manages all phases of material, transportation, supplies, maintenance, and propellants in support of all SD programs and projects, including Space Boosters, and Space Transportation Program, Defense Dissemination Program, and the Satellite Data Systems. SD has project office responsibility for the Global Positioning Satellite Joint Program. Provides assistance to the Aerospace Medical Division to ensure that medical research and support requirements are determined concurrently with system development. SD operates Los Angeles AFS, CA and Ft MacArthur, CA and is responsible for all support, operational, and maintenance requirements at these facilities.

B. (U) Program Accomplishments and Future Programs:

(1) (U) FY 1982 and Prior Accomplishments: Not applicable. This is a continuing program.

(2) (U) FY 1983 Program: This is an in-house effort by the Space Division which supports many program elements and projects in the Research, Development, Test and Evaluation community, and associated procurement programs.

(3) (U) FY 1984 Plannod Program: This is a continuing program, the main cost of which (58%) is for pay of civilian personnel. FY 1983/FY 1984 program effort increases are due to the Space Transportation System (STS), Space Defense System (SDS), the operation and maintenance of Ft MacArthur effective 1 Oct 82, and the special secretary pay scale which became effective 21 Mar 82.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

13. (U) PROJECT OVER $10 MILLION IN FY 1984:

A. (U) Armament Division: This Program Element provides the funding to support the Armament Division's Deputy Commander for Development and Acquisition (AD/CZ). The AD/CZ organization includes the Armament Division's System Program

Program Element: #65806F
DOD Mission Area: #471- General Management Support

Title: Acquisition and Command Support
Budget Activity: #6 - Defense-wide Mission Support

Offices and related technical and management support organizations that plan and conduct programs for the development, acquisition, test and evaluation of air armament systems. This includes air-launched missiles, guided and unguided nonnuclear munitions, direct fire weapons, ammunition, chemical/biological warfare systems, and armament suspension equipment. Also included are programs for Air force installation survivability and point defense systems, aerial targets, operational test and training range instrumentation and threat simulators. The AD/CZ also provides CONUS liaison for the RAPIER missile program; maintains the AF nonnuclear stores data bank; manages the AF Nonnuclear Evaluation Program; manages the Advanced Medium Range Air-to-Air Missile (AMRAAM) program and many other surface attack and antiarmor weapons programs. The Armament Division's Headquarters Management functions are funded in PE 65898 and its Base Operating Support and test activities are funded in PE 65807.

B. (U) Program Accomplishments and Future Programs:

(1) (U) FY 1982 and Prior Accomplishments: Not applicable. This is a continuing program.

(2) (U) FY 1983 Program: This is a continuing in-house effort by the organization cited above which supports many program elements and projects in the Research, Development, Test and Evaluation community, and associated procurement programs.

(3) (U) FY 1984 Planned Program: This is continuing program, the main cost of which (89%) is for pay of civilian personnel. Increase is for civilian pay raise, inflation and additional program efforts for air base survivability.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #65807F
DOD Mission Area: #451 - Major Ranges and Test Facilities

Title: Test and Evaluation Support
Budget Activity: #6 - Defense-wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	370,217	353,806	391,035	407,937	Continuing	Not Applicable
2109	Arnold Engineering & Dev Cen	118,923	125,571	133,817	141,788	Continuing	Not Applicable
2110	Western Space and Missile Cen	2,900	0	0	0	0	Not Applicable
2111	Armament Division	106,585	101,342	109,605	110,918	Continuing	Not Applicable
2112	Air Force Flight Test Center	88,534	84,621	103,448	107,716	Continuing	Not Applicable
2114	4950th Test Wing	53,275	42,272	44,165	47,515	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides resources for operating the above Air Force Systems Command test activities which are part of the Department of Defense Major Range and Test Facility Base (MRTFB). Operation of the activities includes both technical and base support functions. These activities provide test and evaluation support to the Air Force, other Services, government agencies, and commercial companies. Many capabilities possessed by the test activities are unique and cannot be found elsewhere.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	360,773	354,273	383,229	Continuing	Not Applicable

FY 82 delta is due to two separate reprogramming actions to pay fact-of-life programmatic cost increases (adds $3,999) and the FY 82 civilian pay raise (adds $5,445); FY 83 delta represents a nonprogrammatic accounting offset adjustment (subtracts $467). An additional $6,278 will be reprogrammed into this program element during FY 83 to fund the 1 Oct 82 civilian pay raise, the pay cap increase and the increased cost of civilian health care and medicare benefits; FY 84 delta represents the 1 Oct 82 civilian pay raise (adds $5,210), the increased cost of the new civilian health care and medicare benefits (adds $2,001) and various other programmatic cost increases (adds $595).

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands) - Not Applicable.

5. (U) RELATED ACTIVITIES: The test activities provide test and evaluation support to Air Force programs and those of other Services and Government agencies. Examples include the Air Launched Cruise Missile, F-15, F-16, MX, Inertial Upper Stage and National Aeronautics and Space Administration Space Shuttle. Additional related activities are covered

under each project.

6. (U) WORK PERFORMED BY: Centers of interest are: AEDC, Arnold AFS, TN; AD, Eglin AFB, FL; AFFTC, Edwards AFB, CA; and the 4950th Test Wing, Wright Patterson AFB, OH. Major contractors performing work at each center, shown in parentheses include: Arnold Research Organization, Inc., PAN AM World Services and Calspan Field Services, Inc. (AEDC); VITRO Services and RCA Missile and Service Division (AD); Dynalectron Corp (6585 Test Group); and Kentron International (AFFTC).

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: None

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: (2109 - Arnold Engineering Development Center (AEDC)

A. (U) Project Description: AEDC provides ground environment test support for Air Force aeronautical, missile and space programs such as Minuteman, M-X, F-15, B-1B, Air Launched Cruise Missile, Antisatellite Missile, Advanced Strategic Air Launched Missile and Advanced Ballistic Reentry Systems, as well as other Service, government agency and industry programs. The center has three facility complexes encompassing wind tunnels, altitude rocket cells, aeroballistic ranges, altitude engine test cells, space chambers and required support and administrative facilities. The test facility complexes are: Von Karman Gas Dynamic Facility which performs aerodynamic testing of scale model aircraft, missile and space systems from Mach 1.5 to 10, testing of large and full-scale satellites, sensors and space vehicles in a simulated space environment and tests of projectiles (both high performance and conventional guns) at various altitudes and reentry conditions; Engine Test Facility which provides altitude environmental testing for aircraft, missile and spacecraft propulsion systems including turbojets, turbofans, and both liquid and solid propellant rockets; and Propulsion Wind Tunnel Facility which provides testing of large-scale models, and in some cases, full scale engine inlet combinations, missiles and space boosters together with their propulsion systems at Mach numbers from 0.5 to 4.5. This National Test Center is used to evaluate aerospace systems, hardware, concepts and prototypes in simulation of operational environments to assist project directors in effective development and acquisition of their systems. These test complexes are used to assist in obtaining an optimal design, evaluation and certification of performance and acceptance of hardware by providing accurate data at minimum cost. The Center also supports programs of the National Aeronautics and Space Administration such as Space Shuttle, the Army Ballistic Missile and the Navy, as well as technology support to the Department of Energy. The Center's facilities are national assets that provide unique test capabilities not available elsewhere.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: AEDC has provided vital environmental test support to most of the national aerospace system development programs such as the F-15, F-16, B-1B, A-10, F100/F110 (formerly the F101 DFE) Engine Model Derivative Program (EMDP), F-111, Minuteman, Inertial Upper Stage (IUS), Titan, Air Launched Cruise Missile (ALCM), Advanced Strategic Air Launched Missile (ASALM), Advanced Medium Range Air-to-Air Missile (AMRAAM) and MX missile. Major direct support for environmental testing was provided for advanced surveillance devices, aerospace propulsion and flight dynamics, and munitions development. Support was provided to the Air Force Logistics Command (AFLC), Army, Navy,

and National Aeronautics and Space Administration (NASA). The MX Stage II Rocket Motor was successfully tested and performance verified at altitude conditions. The contract with the Tennessee Valley Authority (TVA) was re-negotiated to establish more government flexibility and control over demand charge and electric charge rates. AEDC initiated the true test center concept approach to testing. This concept permits more government involvement in test planning, conduct data acquisition and analysis. Construction of the Aeropropulsion System Test Facility (ASTF) is proceeding toward an Initial Operational Capability (IOC) in FY 1985.

(2) (U) FY 1983 Program: Major direct support for environmental testing is being provided for the AMRAAM, MX, ABRES, ASALM, ASAT, B-1B and IUS. Support will be provided to the Air Force Flight Dynamics Lab (AFFDL), Air Force Rocket Propulsion Lab (AFRPL) and Armament Division (AD). Support will continue to AFLC, Army, Navy, NASA, and Industry. Engine testing will continue to dominate the center's workload which includes: Trident II missile motor, J85, KC-135 Reengine and Japan XF-3 Engine tests. Several FY 1982 programs will be continued such as the F100 and F101 Component Improvement Program and F101 Derivative Fighter Engine (F110) development respectively. In order to provide the best possible test data at minimum cost AEDC will continue developing technology and instrumentation to improve and modernize its existing ground test capabilities. Inflation to contracts, contractor personnel benefits, and utilities will cause increases in funding over FY 1982 levels.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The center will continue to be a prime contributor to the successful development of DOD and NASA aeronautical, missile and space systems such as advanced ballistic re-entry systems, Wide-area Anti-armor Munition, Space Shuttle, MX, F-16, Next Generation Trainer, and aircraft store separation testing. Aerodynamic testing programs will be conducted for the Foreign Technology Division. Additionally, AEDC will provide support for other Services, such as the Navy, Army, and commercial industries. Construction of the $575M ASTF will be completed and verification/checkout started. Funds requested for the FY 1984 period will allow AEDC to meet the above objectives by meeting the operating costs associated with user needs. These costs cover the operation and maintenance needs of this RDT&E activity. Included under this blanket are civilian pay, travel, transportation, rents, communications, utilities, contractual services, supplies and equipment and upkeep of existing facilities to provide competent and credible testing.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not Applicable.

9. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: (2111 - Armament Division)

A. (U) Project Description: AD is the host organization at Eglin AFB, FL and is the prime USAF organization charged with nonnuclear armament development. Eglin AFB, located in northwest Florida, is the largest Air Force Base in the free world encompassing 734 square miles of land and 86,500 square miles of water test ranges extending almost 400 miles south into the Gulf of Mexico. Beginning in FY 83, the 6585th Test Group, Holloman AFB, NM, was removed from this Program

Program Element: #65807F

DOD Mission Area: #451 - Major Ranges and Test Facilities

Title: Test and Evaluation Support

Budget Activity: #6 - Defense-wide Mission Support

Element and consolidated in Program Element 65708F to provide better management visibility of its activities. AD accomplishes technology research, engineering development, test, evaluation, and initial acquisition of USAF nonnuclear munitions; is the USAF focal point for munitions integration in aeronautical systems; conducts and supports USAF weapons effectiveness testing, electromagnetic warfare testing, electronics surveillance and control testing, and aeronautical systems testing. AD conducts more than 400 test projects per year. As examples, AD conducted tests of the Advanced Medium Range Air-to-Air Missile (AMRAAM), developed a new, inexpensive high explosive made from fertilizer compounds, was responsible for environmental test of entire aircraft in the McKinley Climatic Laboratory, and manages the Wide Area Anti-Armor Munition (WAAM) program which is developing munitions such as the WASP missile and the Combined Effects Munition (CEM). To accomplish its mission, AD utilizes over 50 instrumented test areas, sites, and ranges, and operates 40 aircraft of seven different types. The ranges are divided into four categories: Armament Systems Test Environment (ASTE), Electromagnetic Test Environment (EMTE), Multipurpose Resources (MPRs), and the Water Test Areas (WTAs). The aircraft types used include F-4, F-15, F-16, F-111, A-10, T-38, and UH-1N. The test and evaluation effort and base operational support requirements are funded under this Program Element. The Acquisition and AD Staffs are funded under Program Element 65806F.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 82 Accomplishments: Armament Division funding was used for the following purposes: operate, maintain, and upgrade the highly instrumented test range complex at Eglin AFB; conduct and support testing in the areas of nonnuclear munitions, electromagnetic warfare, and missiles and munitions/aeronautical system integration; support USAF, OSD, and other government agencies in test programs; provide administrative, logistical and technical support to approximately 10,000 assigned tenant personnel. Major programs which were supported include: Advanced Medium Range Air-to-Air Missile (AMRAAM), Low Level Laser Guided Bomb (LLLGB), Wide Area Anti-armor Munition (WAAM), IR Maverick, Seeker Evaluation and Test System (SETS) and PAVE MOVER. Additionally, the Armament Division funded the operation, maintenance and upgrade of the Central Inertial Guidance Test Facility (CIGTF), High Speed Test Track, and Radar Target Scatter(RATSCAT) Facility at the 6585th Test Group, Holloman AFB, NM.

(2) (U) FY 83 Program: Armament Division funding will continue: operation, maintenance, and modernization efforts at the Eglin test complex; the nonnuclear munition and electromagnetic warfare development, test and evaluation mission; and support of tenant organizations. Major programs which will be supported include: Airborne Seeker Test System (ASETS), AMRAAM, LLLGB, FLYCATCHER, WASP anti-armor missile, and GPS-based Target Acquisition and Control System (GTACS). Beginning in FY 83, support of all 6585th Test Group activities previously funded in this Program Element were transferred to Program Element 65807F.

(3) (U) FY 84 Planned Program and Basis for FY 84 RDT&E Request: Many of the prior year programs supported will continue. These will include: F-15 SEEK EAGLE, AMRAAM, LANTIRN, and HELLFIRE Missile. New programs to be supported will include: Conventional Standoff Weapon, B-1 Munition Timer, AN/ALQ-172 Countermeasure Set, and RF-5E PEACE STRIKE III. Funds requested for the FY 1984 period will allow AD to meet the above support objectives by meeting the operating costs associated with user needs. These costs cover the operation and maintenance needs of this RDT&E facility. Cost includes civilian pay, travel, transportation, rents, communications, utilities, contractor services, supplies and

Program Element: #65807F | Title: Test and Evaluation Support
DOD Mission Area: #451 - Major Ranges and Test Facilities | Budget Activity: #6 - Defense-wide Mission Support

equipment and up-keep of existing facilities to provide competent and credible testing of weapon systems under development.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

10. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: (2112 - Air Force Flight Test Center).

A. (U) Project Description: The AFFTC conducts and supports tests of aircraft and aircraft systems, aerospace research vehicles, remotely piloted vehicles, cruise missiles and parachute delivery/recovery systems. Major weapon systems undergoing testing at Edwards AFB, CA include the A-10, F-15, B-1, and Air Launched Cruise Missile. The 6514th Test Squadron at Hill AFB, UT, conducts tests of remotely piloted vehicle systems and the Ground Launched Cruise Missiles using the Utah Test and Training Range to evaluate research, tactical and reconnaissance drone systems for military applications. Air Force parachute testing is the responsibility of the 6510th Test Wing. The AFFTC also operates the United States Air Force Test Pilot School which annually trains 50 Department of Defense, allied and contractor test pilots and flight test engineers.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Testing continued on the A-10, F-15, F-16, B-1A, and B-52 programs. The derivative fighter comparative evaluation began in FY 1982. The F-16 Advanced Fighter Technology Integration Program also started and will continue into FY 83. The RC-135 Reengine program and F-5G program testing also began. Ground Launched Cruise Missile testing is ongoing. The B-52 improvements and ALCM testing continued. Various technology base programs are being tested including such programs as the F-15 Integrated Flight Fire Control System. Space Shuttle operations are being conducted by NASA with Air Force participation. Preparation for testing of the B-1B, and Low Altitude Navigation and Targeting Infrared System for Night (LANTIRN) programs are ongoing.

(2) (U) FY 1983 Program: The B-1B will be tested. Various A-10, F-15, F-16 and cruise missile programs will continue throughout FY 83. Derivative fighter comparitive evaluation continues and the F-16 Multi-Stage Improvement Program testing will begin. The ASAT and LANTIRN program begin testing in FY 83. Various cruise missile test programs will continue throughout FY 83. Edwards AFB will continue to be involved in the Space Shuttle program both as the prime landing site and then as the back up landing site. Preparation for flight testing of the UH-60, and NGT will be ongoing.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: FY 1984 is the beginning of a surge period in flight testing. The B-1B, A-10, F-16, cruise missile ASAT, F-16 XL, LANTIRN and F-5G Programs will continue through FY 1984. In addition, flight testing of the UH-60, T-46 and medium range air-to-surface missile will begin. Space Shuttle support will continue. Funds requested are required to provide the operations and maintenance of the AFFTC to meet the support requirements of the above programs. These costs include civilian pay, travel, transportation, rents,

Program Element: #65807F | Title: Test and Evaluation Support
DOD Mission Area: #451 - Major Ranges and Test Facilities | Budget Activity: #6 - Defense-wide Mission Support

communications, utilities, contractor services, supplies and equipment and up-keep of existing facilities to provide the industrial funded test base required for competent and credible test and evaluation.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not Applicable.

II. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: (2114 - 4950th Test Wing).

A. (U) Project Description: The 4950th Test Wing, Aeronautical Systems Division, Wright-Patterson AFB OH, performs flight tests of aircraft and airborne systems, supports space vehicle tracking for the Space Division and other DOD and National Aeronautics and Space Administration agencies, and operates the Air Force Systems Command's (AFSC) major Class II aircraft modification facility. Flight tests have varied from evaluations of an airborne sidefiring cannon to investigation of state-of-the-art airborne laser systems and night attack sensors. The Wing has the capability to conduct full-scale engineering evaluations, airborne instrumentation and data reduction, Class II aircraft modification and extensive technical photo documentation. Staging out of 25 overseas bases, the Advanced Range Instrumentation Aircraft (ARIA) fleet of seven aircraft provide telemetry support for the NASA and DOD missile launches out of Cape Canaveral, FL, and Vandenberg AFB, CA. The Deputy Commander for Aircraft Modification accomplishes mechanical and electronic modifications to AFSC test aircraft to support flight test programs. Fabrication support is also provided to the Air Force Wright Aeronautical Laboratories. The Wing possesses functional managerial responsibility for Class II Aircraft Modification policy throughout AFSC.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Flight test accomplishments include Airborne Laser Laboratory (which is a continuing C-135 program thru FY 87), Tactical Bistatic Radar (a joint C-130/C-135 test program), Crosseye ECM (a C-135 test bed warning radar system for SAC B-52's), SABRE CROSS (contractor-funded T-39 test bed advanced radar proposed for the F-16 and B-1), Little/Big Crow (a joint T-39/C-135 test bed aircraft modified to support the Army Patriot program - electronic jamming capability), and MERLA (which is a C-135 test bed aircraft supporting a classified SAC program). Twenty projects received Class II modifications in FY 82. Big Crow (C-135) deployed to Europe to support two NATO exercises. ARIA support of DOD and NASA missile/space vehicle launch telemetry and Air Launched Cruise Missile programs continued. Two of the ARIA EC-135s were reengined using JT-3D engines from the Boeing 707-100 series AFLC engine donor program. As a result of the DOD directed Strategic Systems Test Support Study, the ARIA Phased Array Telemetry Antenna System (APATS) was terminated. The 4950th Test Wing obtained a Computer Aided Design (CAD) capability. Work continues on incorporating a Computer Aided Manufacturing (CAM) capability.

(2) (U) FY 1983 Program: Flight test programs to be supported include SABRE CROSS, Infrared Properties/Aerospace Radio Propagation (which are two continuing Air Force Geophysics Laboratory projects on dedicated C-135 aircraft), Airborne Laser Laboratory, Aircraft Navigation System Verification (which are C-141/C-130 compatible palletized

systems used to check out navigation systems at Holloman AFB, NM), NAVSTAR and ALCM. Also ARIA will continue to support telemetry tracking coverage requirements of various Army, Navy, Air Force, and NASA projects to include both tactical and strategic testing. Work will accelerate on the Wing's CAD/CAM program. Wing operation/maintenance crews will continue proficiency training on the C-18A aircraft. Increased C-18A training flights will exercise the logistics supportability of the aircraft system. Extensive aircraft modification continues on the EC-18B/ARIA conversion. Emphasis will be placed on the special procedures used for certain small test programs which will expedite the Class II aircraft modification procedure for these selected programs.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Maintain efforts on continuing flight test and ARIA support of DOD and NASA programs. Continue RTO and PTO support for specified, future DOD flight test programs. Use of integrated CAD/CAM system to conduct engineering design and fabrication of Class II aircraft modification is anticipated. With the programmed increase in the 4950th Test Wing manpower, less Class II aircraft modification projects will be contracted for engineering design, manufacturing, and installation. Prototype EC-18B/ARIA conversion will be accomplished and flight testing started. Two more EC-18B/ARIA conversions will be underway. The ARIA fleet will eventually consist of six EC-18B and two EC-135E (JT-3D reengined EC-135 A-Model ARIA). The Wing will start MX and TRIDENT strategic testing support in Broad Ocean Areas in the Pacific and Atlantic areas.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #65808F Title: Advanced Systems Engineering/Planning
DOD Mission Area: #440, Technical Integration/Studies & Analyses Budget Activity: #6, Defense-wide Mission Support

1. (U) RESOURCES (PROJECT LISTING) ($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	4,981	3,500	2,386	6,098	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Air Force conducts development planning (mission area planning, systems architecture, and systems planning) to convert operational requirements into effective weapon systems. This Program provides technical support for the development planning function at the Electronic Systems Division and the Space Division. This includes the definition of technology needs, and architecture required to meet national objectives and the initial system definition necessary to satisfy operational requirements.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	4,981	5,443	5,894		Continuing	N/A
Procurement	Not Applicable					

FY 1983: Congressional reduction; no rationale provided.
FY 1984: Reduced advanced concept studies.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable

5. (U) RELATED ACTIVITIES:
The space architecture and the command, control, communications and intelligence architecture activities supported by this program element provide the advanced development planners with the time-phased capabilities needed. The "technology needs" identified and published in the Technology Planning Guide provide guidance to the basic research and exploratory development planners and the associated 6.1 and 6.2 program elements.

6. (U) WORK PERFORMED BY: The primary technical support for this program is provided by the Aerospace Corporation, El Segundo, CA, and the MITRE Corporation, Bedford, MA. The Aerospace and MITRE Corporations have been designated Federal Contract Research Centers (FCRCs) and, as such, may have access to contractor proprietary data and to sensitive Air Force procurement information. This capability allows these contractors to provide unique and necessary support to the Air Force development planning function.

Program Element: #65808F   Title: Advanced Systems Engineering/Planning
DOD Mission Area: #440, Technical Integration/Studies & Analyses   Budget Activity: #6, Defense-wide Mission Support

7. (U) ADVANCED SYSTEMS ENGINEERING/PLANNING (Single Project Less Than $10 Million in FY84)

A. (U) Project Description: This program provides technical support for the development planning function at the Electronic Systems Division and the Space Division. The effort includes the identification of new concepts and technology for future systems; the architectural plans for future strategic and tactical systems; the identification of conceptual capabilities; and the initial program planning for systems acquisition programs required to satisfy operational needs. The overall objective is to provide early guidance to technology base programs through identification of advanced capability concepts so that technology and concepts will be available when operational needs are identified.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY82 Accomplishments: Electronic Systems Division developed the communications portion of the Tactical Air Forces C^3 Architecture in support of the European Theater; initiated a contract to evaluate the applicability of VHSIC technology to future TAC systems C^3 requirements; developed/published a Technology Planning Guide which translates future C^3I system requirements into technology planning guidance to Air Force Laboratories and Centers; and published several Interoperability Requirements Documents. Space Division completed and published the Architecture for Military Space Systems (Space Plan); developed a Satellite Control Architecture; established a Space Station Requirements Working Group to identify military requirements for a Space Station; and developed a Space Systems Survivability Investment Strategy.

(2) (U) FY83 Program: At Electronic Systems Division a contract will be initiated to extend the capability of the existing Life-Cycle-Cost estimated model for communications terminals; technical approaches, configurations, and operations concepts for future Air Traffic Control (ATC) systems will be investigated; and fighter operations alternatives planning will be accomplished to propose alternatives to satisfy prioritized deficiencies identified by HQ USAFE. Space Division will emphasize efforts associated with Architecture for Military Space Systems, Space Systems Survivability, Advanced Space Systems Applications, Total Exploitation of Space Assets (TESA), and Military Missions Analysis of a Modular Space Station.

(3) (U) FY84 Planned Program and Basis for FY84 RDT&E Request: Electronic Systems Division will investigate potentially valuable new communications systems concepts such as METEOR BURST, and Airborne Communications Restoral Relay; evaluate advanced concepts for future Air Traffic Control Systems including advanced navigational aids, mobile tactical microwave landing systems, and integration of Air Traffic Control and Air Defense radars; and complete the USAFE Fighter Operations Alternatives effort. Space Division will continue to iterate/update the Space Plan; support the Tactical Exploitation of National Capabilities (TENCAP), a project established be Congress to insure national space systems are used to the best advantage; accomplish sub-system and system evaluation to assess the operational, technical, and economic bases for promising space-based discriminating attack systems; and continue efforts on the TESA project to enhance the exploitation of existing space systems.

(4) (U) Program to Completion: This is continuing program.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #65872F
DOD Mission Area: #471 - General Management Support

Title: Productivity Improvement
Budget Activity: #6 - Defense-wide Management and Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983* Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0	0	4,109	0	0	4,109
	ASD - Document System	0	0	0	0	0	
	AEDC - CAD/CAM System	0	0	2,060	0	0	2,060
	AD - TV Ordnance Scoring System	0	0	245	0	0	245
	AD - Word Processing System	0	0	162	0	0	162
	ESD - Information Mgt System	0	0	1,352	0	0	1,352
	HQ AFSC - Admin Automation System	0	0	290	0	0	290

* The Dec 82 FY 83 Continuing Resolution zeroed out the $2,201 in FY 83 funding for the AF RDT&E Productivity Improvement program. The CRA report stated that the effort could clearly be deferred one year in favor of funding higher Air Force priority programs.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: ($ in thousands) Productivity Improvement. This USAF RDT&E funded Productivity Improvement Program Element is but a small portion (less than two percent by dollar amount) of the OSD sponsored Productivity Investment Fund (PIF) program. This is a continuing OSD-wide program to provide funds for the purchase or lease of productivity enhancing equipment and facilities. Candidate PIF projects for USAF activities funded by the RDT&E appropriation are submitted by Headquarters Air Force Systems Command (HQ AFSC) to HQ USAF for extensive review and validation prior to competing for PIF set-aside funds within OSD. To be eligible for PIF money, proposals must: cost at least one hundred thousand dollars; produce sufficient operation and maintenance and/or personal savings to offset total investment costs (amortize) four years or less; and be submitted to HQ USAF by 1 June to be eligible for the next FY PIF dollars. Projects may be approved by OSD for incremental funding for up to three successive fiscal years. The five FY 84 projects listed above were closely scrutinized and competitively selected to ensure that they met all PIF program criteria. Collectively, they will provide a four year return-on-investment (ROI) of $20,801 and a life cycle ROI of $34,957.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	0	2,201	2,260	4,472

Program Element: #65872F
DOD Mission Area: #471 - General Management Support

Title: Productivity Improvement
Budget Activity: #6 - Defense-wide Management and Support

FY 82: No change.

FY 83: The Dec 82, FY 83 Continuing Resolution zeroed out the $2,201 in FY 83 funding for the AF RDT&E Productivity Improvement Program. Consequently the two FY 83 projects must either be deferred or funded from available TOA within other AF programs.

FY 84: Increase of $1,838 represents the addition of four new projects to the FY 84 AF RDT&E Productivity Improvement program. Additional PIF projects are added on an annual basis after being competitively selected by OSD, however projects may be approved for incremental funding for up to three consecutive fiscal years.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands): Not applicable.

5. (U) RELATED ACTIVITIES: This AF RDT&E Productivity Improvement program provides all Air Force Systems Command (AFSC) RDT&E activities the opportunity to participate in the OSD sponsored Productivity Investment Fund (PIF) program. Each project selected must produce sufficient operating and maintenance and/or personnel support savings to offset total investment costs in four years or less. Thus, the AF RDT&E Productivity Improvement program supports equipment and facilities investments at organizations throughout AFSC. Other RDT&E operations and support costs for these AFSC organizations are funded from Program Elements such as PE 65806F, PE 65807F, and PE 65898F.

6. (U) WORK PERFORMED BY:

Major Contracts: (U) No Contracts have been awarded under this program pending FY 84 approved obligational authority to commit and obligate funds. Each of the five FY 84 projects will require a minimum of one procurement contract with the possibility of associated installation and service/maintenance contracts.

Air Force Activities: (U) The Arnold Engineering and Development Center (AEDC), Arnold AFS, TN is the implementing organization for the Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) system. The Armament Division (AD), 3246th Test Wing/Mission Scheduling & Control Office located at Eglin Air Force Base, Florida is the responsible organization for the Television Ordnance Scoring System. The 3246th Test Wing designed the system and will manage its use. The Armament Division (AD), Deputy for Contracting and Manufacturung will plan, implement and manage the requested word processing system. Electronic Systems Division/(ESD), Comptroller (AC), Hanscom AFB, MA, will manage and integrate the Information Resource Management System in order to manage Electronic Systems Division's financial matters. Headquarters Air Force Systems Command/HQ AFSC, Director of Administration (DA), Andrews AFB, MD, will direct the acquisition of equipment and manage the system activities for the automated centralized forms and publishing system.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: ($ in thousands)

A. (U) Project: Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) System for Arnold Engineering and Development Center (AEDC), Arnold AFS, TN - The system will increase productivity in: Graphical Art, Numerical Control, Finite Element Modeling, and Design/Drafting Activities. Over a seven year period, the proposed system would produce a

Program Element: #65872F
DOD Mission Area: #471 - General Management Support

Title: Productivity Improvement
Budget Activity: #6 - Defense-wide Management and Support

savings of 795,212 manhours and $10,648 in salaries. This increase in productivity will help solve the problem of locating an adequate number of qualified personnel to fill current vacancies. The new system will consist of three Central Processing Units, 32 graphic work stations, and needed peripherals such as printers/plotters. Also, the system will have the capability to run three-dimensional software. This capability is not currently available at Arnold Engineering and Development Center (AEDC). The workload has caused the Central Processing Unit now in use to be fully configured at maximum potential. The FY 84 AEDC CAD/CAM projects were planned to complete Phase II of a two year equipment purchase and installation project. The Dec 82 FY 83 continuing Resolution zeroed out FY 83 funding for this project, therefore it is anticipated that project initiation will be slipped to FY 84.

B. (U) Project: Television Ordnance Scoring System for Armament Division (AD), Eglin AFB, FL - This project will provide a capability to accurately, automatically and remotely score single or multiple ordnance deliveries against ground targets on the Armament Division's tactical training range TA-C-62. The basic features of the system are a control center, a center camera site, a flank camera site, surveyed aim points, and calibration markers. The system will include devices to transmit test data to a control facility on Eglin Air Force Base. The range is located 31 miles from Eglin Air Force Base thus requiring transportation for personnel and machinery. The proposed system would eliminate the need for two six passenger vehicles and reduce manning of TA-C-62 by five manpower authorizations. It will also increase training support from 12 hours each day, five days per week to 18 hours each day seven days per week and provide increased accuracy over the present manual scoring system. This is a new start project in FY 84.

C. (U) Project: Word Processing System for Armament Division (AD, Eglin AFB, FL - The objective of this project is to improve the quality and timely processing of contractual documents by using ten word processors within the Armament Division's Deputy for Contracting & Manufacturing located at Eglin AFB. These word processors will generate the equivalent of 11.6 additional manpower authorizations. Further, it will return the investment in only five months. This represent a manpower savings of $1,775 over the five year economic life of the system. This is a new start project in FY 84.

D. (U) Project: Information Resource Management System for Electronic Systems Division (ESD), Hanscom AFB, MA - This system will make available to the Comptroller professionals distributed throughout the Electronic Systems Division an integrated system to manage financial matters. This will be done through the use of one mini-computer, 103 terminals, 103 modems, two desktop copiers, two dictation systems, three executive telephones, two facsimiles machines, two word processors, two optical character readers, and microfiche equipment. Implementation of this system is equivalent to hiring 72.8 trained personnel. The initial investment is recouped in six months. This is a new start project in FY 84.

E. (U) Project: Administrative Automation System for Headquarters Air Force Systems Command (HQ AFSC), Andrews AFB, MD - This system will automate and centralize forms management and publication activities. The automation equipment consists of an optical character reader, word processing equipment, a keyboard preview station, a diskette protocol converter, an ad mark-up composer, an off-line text keyboard, a phototypesetter, a resin coated paper processor, and a waxer. Initial equipment costs will be offset by a first year variable savings potential of $2,648 and a manpower reduction yielding a five year fixed savings of $1,421. Currently, it takes 14 hours at the cost of two hundred forty dollars per draft page to publish a standard publication; the new system will perform the task in 9.5 hours at a cost of one hundred seventy four dollars per draft page. In addition, this system will decrease the publications turnaround time from 50 days to 27 days. This is a new start project in FY 84.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #65890F
DOD Mission Area: General Management Support, #471

Title: Installation Audiovisual Support
Budget Activity: Defense-Wide Mission Support, #6

1. (U) RESOURCE (PROJECT LISTING) ($ IN Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	5,394	5,622	5,815	5,799	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This includes base Audiovisual (AV) libraries, photo labs, graphic arts, presentation services and other AV activities that support Air Force Systems Command (HQ AFSC) divisions, test center, related laboratories and research centers. This is support of administration audio-visual activities and includes audiovisual efforts associated with technical programs/projects.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

		4,420	5,622	5,756		Continuing	Not Applicable

The increase in the FY 1982 funding reflects reprogramming to sustain required services. The increase in FY 1984 reflects an inflation adjustment.

4. (U) OTHER APPROPRIATION FUNDS: None

5. (U) RELATED ACTIVITIES: N/A

6. (U) WORK PERFORMED BY: Audiovisual personnel located at the AFSC organizations indicated in item 2 above.

7. (U) INSTALLATION AUDIOVISUAL SUPPORT (SINGLE PROJECT LESS THAN $10M IN FY 1984): This program element funds continuing audiovisual support for Air Force Systems Command.

8. (U) PROJECT OVER $10M IN FY 1984: N/A

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #65898F
DOD Mission Area: #471 - General Management Support
Title: Management Headquarters - Research and Development
Budget Activity: #6 - Defense-wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual*	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	22,530	34,341	37,588	37,145	Continuing	N/A
	HQ AFSC	22,530	23,091	25,169	24,667		
	HQ ASD*	0	3,246	3,572	3,534		
	HQ ESD*	0	2,205	2,420	2,399		
	HQ AMD*	0	1,089	1,250	1,421		
	HQ AD*	0	1,537	1,688	1,671		
	HQ SD*	0	3,173	3,489	3,453		

* The Management Headquarters function at the AFSC Product Divisions (ASD, ESD, AMD, AD & SD) were transfered into this Program Element, effective 1 Oct 82.

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides the resources to support the Commander, his staff, the technical mission and support functions for Headquarters Air Force Systems Command (HQ AFSC), and the Commander and his headquarters management staff at the following activities: Aeronautical Systems Division (ASD), Wright-Patterson AFB, OH; Electronic Systems Division (ESD), Hanscom AFB, MA; Armament Division (AD), Eglin AFB, FL; Aerospace Medical Division (AMD), Brooks AFB, TX; and Space Division (SD), Los Angeles AFS, CA. Categories of cost include civilian pay and the related costs of civilian personnel, travel expenses for military and civilian personnel, transportation, rents, contractual services, supplies and equipment.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	32,400	35,341	35,766		Continuing	N/A

Changes from the FY 83 descriptive summary pricing are due to the following:

FY 82: Reflects the reprogramming actions taken for the 1 Oct 81 civilian pay raise (adds $1,005) and other unfunded requirements (adds $625), and the Management Headquarters adjustment from PEs 62202F, 65806F and 65807F (subtracts $11,500). Note: The Management Headquarters function at each of the AFSC Product Divisions was not funded by PE 65898F until FY 83.

FY 83: Reflects the Congressional reduction as listed in the Dec 82 FY 83 Continuing Resolution (subtracts $1,000).

Program Element: #65898F Title: Management Headquarters - Research and Development
DOD Mission Area: #471 - General Management Support Budget Activity: #6 - Defense-wide Mission Support

FY 84: Reflects the 1 Oct 82 civilian pay raise (adds $1,270), health and medicare benefits (adds $503), pay cap adjustment (adds $80) and a programmatic accounting adjustment (subtracts $31).

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands) - Not applicable.

5. (U) RELATED ACTIVITIES: This program provides funding for Headquarters Air Force Systems Command (AFSC) and the headquarters staff at each of the AFSC Product Divisions. The funding to support the associated technical mission, program offices and air base support functions at each of the AFSC Product Divisions is provided by PE 65806F, Acquisition and Command Support.

6. (U) WORK PERFORMED BY:

Major Contractors: Not Applicable.

Air Force Activities: Headquarters Air Force Systems Command, Andrews AFB, MD provides the centralized management for the development and acquisition of the Air Force's weapon systems. These systems include aircraft, missiles, satellites, electronics and other weapons systems needed to satisfy Air Force requirements. The following AFSC Product Divisions are charged to perform discrete portions of the overall AFSC RDT&E mission: Aeronautical Systems Division, Wright-Patterson AFB, OH is responsible for management of aeronautical systems. Electronic Systems Division, Hanscom AFB, MA is responsible for command, control and communications systems. Aerospace Medical Division provides biomedical support for aerospace systems. Armament Division, Eglin AFB, FL is responsible for validation, development and production of non-nuclear air armament systems. Space Division, Los Angeles AFS, CA plans, programs and manages the AF space systems.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. (U) Aeronautical Systems Division (ASD). Program Element provides funding to support the Headquarters Management staff of Aeronautical Systems Division. ASD manages acquisition of aeronautical systems, subsystems, and related equipment programs and projects until transfer of program management responsibility to Air Force Logistics Command (AFLC); accomplishes systems engineering and technical direction to designated programs and provides general engineering support in applicable disciplines; exercises overall responsibility for Development, Test and Evaluation (DT&E) for assigned advanced and engineering development; and exploits exploratory and advanced development products, including foreign technology. ASD has responsibility for approximately 250 programs such as the B-1, F-16, and F-15.

B. (U) Electronic Systems Divison (ESD). Program Element provides funding to support the Headquarters Management staff of Electronic Systems Divison. ESD plans and manages the acquisition and related engineering development of command, control and communications, and intelligence electronic systems, subsystems and equipment; plans and conducts research and exploratory and advanced development programs in areas of information development; exploits exploratory and advanced development products, including foreign technology; manages the operations of the Electromagnetic Compatibility Analysis Center; and manages assigned Foreign Military Sales (FMS) program. ESD has responsibility for approximately

Program Element: #65898F | Title: Management Headquarters - Research and Development
DOD Mission Area: #471 - General Management Support | Budget Activity: #6 - Defense-wide Mission Support

25 Program Offices and a multitude of major programs such as Traffic Control Approach and Landing System, Airborne Warning and Control System (AWACS), Over the Horizon Radars, Advanced Airborne Command Post, and Joint Tactical Information Distribution System (JTIDS).

C. (U) Aerospace Medical Division (AMD). Program Element provides funding to support the Headquarters Management staff of the Aerospace Medical Divison. The AMD plans and executes the Air Force Systems Command (AFSC) exploratory, advanced, and engineering development programs to provide biomedical support for aerospace systems; advance aerospace biotechnology; determine the personnel hazards of aerospace environments and establish the associated human tolerances extend human capabilities and enhance integration of man in weapon systems; provide biomedical support for personnel subsystems; improve Air Force health services; and provide technical and/or management assistance in these areas to support studies, analyses, development planning, acquisition, test, evaluation, modification and/or operation of aerospace systems and related equipment.

D. (U) Armament Division (AD). Program Element provides funding to support the Headquarters Management staff at Armament Divison (AD). AD plans and conducts programs for research and technology, systems acquisition, and test and evaluation for air armament, to include air-launched missiles, guided and unguided nonnuclear munitions, direct fire weapons, ammunition, chemical and biological warfare systems and suspension equipment and related systems, and for Air Force installation survivability and point defense systems, aerial targets, range instrumentation and threat simulators. AD is the lead agency for determination and certification of aircraft/stores structural, aerodynamic and electromagnetic compatibility. AD is responsible for test and evaluation of target acquisition and delivery systems for air armament, electronic combat systems, components, and equipment, electromagnetic target and background signature measurements, aided and unaided inertial guidance systems and high speed escape systems.

E. (U) Space Division (SD). Program Element provides funding to support the Headquarters Management staff of Space Division. The mission of SD is to plan, program, and manage systems programs to acquire space systems, subsystems, support equipment, and related hardware and software; provide for the maintenance, construction, or alteration of launch, tracking, and support facilities; conduct advanced development technology programs to support future space missions; provide for launch and flight test support of major DOD programs and those of other federal agencies; perform the function of launch, on-orbit satellite tracking, data acquisition, and command and control of DOD satellites; and discharge USAF responsibilities for designated USAF, DOD, and international space programs.

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

A. (U) HQ Air Force Systems Command: The mission of Air Force Systems Command (AFSC) is to advance aerospace science and technology, apply it to aerospace systems development and improvement, and acquire the qualitatively superior aerospace systems and equipment needed to accomplish the Air Force mission. Specifically, the Commander and his staff: Manage the aerospace systems equipment acquisition programs; act as the primary Air Force agent for technical advocacy of development programs to provide the technology and capability to fulfill known or anticipated Air Force operational requirements; maintain in-house laboratories of superior quality to conduct research in selected scientific areas dealing with Air Force needs; plan, develop and manage - through a central authority - aerospace vehicle launch facilities, range

Program Element: #65898F
DOD Mission Area: #471 - General Management Support

Title: Management Headquarters - Research and Development
Budget Activity: #6 - Defense-wide Mission Support

communication - electronics and instrumentation, worldwide satellite control, and recovery facilities for assigned Department of Defense (DOD), National Aeronautics and Space Administration (NASA), and other United States Government agency programs; plan, conduct and manage systems; systems support; research, exploratory development engineering, and advanced development programs in bioastronautics, research programs in support of the Air Force personnel systems, clinical and aerospace medicine requirements, and specialized aerospace medical education programs; conduct and manage foreign technology program to provide a current foreign aerospace technical threat assessment for use in systems planning and acquisition; perform development, testing and evaluation to establish the technical adequacy, safety, environmental consequences, qualitative characteristics of systems and equipment; conduct such research and development activities as necessary to ensure that environmental and ecological considerations are reflected in the course of accomplishing the overall RDT&E mission; and provide liaison between the Air Force and the scientific community in areas of potential Air Force interest. This program provides the management support resources for the AFSC Commander at Headquarters AFSC and for the Commander and his Headquarters Management Staff at each of the AFSC Product Divisions.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: This is a continuing program providing funding to support the HQ AFSC staff, and the Headquarters Management Staff at each of the AFSC Product Divisions.

(2) (U) FY 1983 Program: The program provides resources to continue the operation of HQ AFSC, and support the Commander and his management staff at each of the AFSC Product Divisions as listed above.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: This is a continuing effort. The major portion of the total funding for this program, i.e., 85%, is used to pay civilian personnel. Program increases in FY 84 and FY 85 compensates for inflation, and provides funding to increase civilian manning to currently authorized levels and to initiate programs to upgrade the information and data management systems at HQ AFSC.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #35110F
DOD Mission Area: #410, Space Launch and Orbital Support

Title: Satellite Control Facility
Budget Activity: #6, Defense-wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ IN THOUSANDS)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
TOTAL FOR PROGRAM ELEMENT		67,645	60,219	72,449	86,780	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The objective of this program is the maintenance of a highly reliable national satellite tracking, telemetry and commanding (TT&C) capability to support the development and operation of DOD satellite systems. The Air Force Satellite Control Facility (AFSCF) consists of a global network which includes instrumentation systems, antennas, communications, and data processing equipment required to support a growing inventory of increasingly complex space vehicles.

3. COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ In Thousands)

RDT&E	67,900	60,877	67,988		Continuing	N/A
Procurement (Aircraft)	1,428	1,982	680		Continuing	N/A
Procurement (Other)	565	11,441	20,765		Continuing	N/A

Significant program changes include: RDT&E - offsetting changes in FY 84 include the delay of Enduring Satellite Control enhancements until FY 85, acceleration of the Automated Remote Tracking Station to FY 84 to be compatible with the antenna procurement schedule, and programmatic increases to the Data Systems Modernization (DSM) program; Procurement delay of Satellite Control Facility (SCF)/Defense Meteorological Satellite Program (DMSP) interoperable antenna from FY 84 to FY 85 and [

4. (U) OTHER APPROPRIATION FUNDS:

	FY 1982	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Estimated Costs
Procurement (Aircraft)	1,428	1,982	1,567	303	Continuing	N/A
Procurement (Other)	565	11,093	7,867	43,773	Continuing	N/A
Military Construction	6,530	11,700		2,982	Continuing	N/A
Operations and Maintenance	57,393	60,238	74,522	99,282	Continuing	N/A

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Program Element: #35110F
DOD Mission Area: #410, Space Launch and Orbital Support

Title: Satellite Control Facility
Budget Activity: #6, Defense-wide Mission Support

5. (U) RELATED ACTIVITIES: Both Defense Communications System (DCS) and non-DCS telecommunications program activities relating to the Satellite Control Facility (SCF) are contained in Program Element (PE) 35151F (SCF Telecommunications). Real property maintenance activities relating to the SCF are contained in PE 35894F (Real Property Maintenance, AFSC). SCF base operating support is contained in PE 35896F (Base Operating Support, AFSC). The majority of DOD satellite programs rely, to varying degrees, on the SCF for support. The Defense Meteorological Satellite Program (DMSP), PE 35160F, and the SCF will cooperate to install an interoperable TT&C antenna at the Thule Remote Tracking Station, provide a backup control center for DMSP, and close the DMSP Loring AFB Command Readout Station. The Global Positioning System (GPS), PE 35165, and the SCF will cooperate to assure interoperability between GPS Ground Antennas and SCF Remote Tracking Stations, and provide a backup to the GPS Master Control Station at the Satellite Test Center (STC). The Consolidated Space Operations Center (CSOC), PE 35130F, will provide increased capability and survivability by sharing the control functions of the STC. CSOC will also provide control of DOD Shuttle missions.

6. (U) WORK PERFORMED BY: Air Force management of this national capability is under Space Division, Los Angeles CA. Principal contractors are: Lockheed Missile and Space Company (LMSC), Sunnyvale CA, which provides study and development analysis for the STC; Ford Aerospace Communications Corporation (FACC), Palo Alto CA, which provides study and development analysis for the Remote Tracking Stations (RTS); System Development Corporation, Santa Monica CA, which provides computer system integration; Applied Research, Inc., Santa Clara CA, which provides systems engineering, integration and test analysis; and IBM Corporation Gaithersberg, MD which was awarded the development/ acquisition contract for the Data Systems Modernization program for the network. In addition to RDT&E support LMSC, FACC, and other contractors provide operations and maintenance support for the network.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: None

8. (U) TOTAL PROGRAM (No Separate Projects)

A. (U) Program Description: The Satellite Control Facility is a world-wide network consisting of a Headquarters at Sunnyvale CA; seven geographically dispersed tracking stations; a communications satellite calibration site at Camp Parks CA; a control center (the Satellite Test Center at Sunnyvale); and a satellite recovery group at Hickam AFB HI. The mission of the SCF is to provide tracking, real-time telemetry, commanding, and recovery of Department of Defense space vehicles operating in a multi-satellite environment. The SCF supports satellites operating with various orbital parameters to accomplish diversified test and operational objectives for the Air Force, the Navy, other DOD agencies, the National Aeronautics and Space Administration, and the North Atlantic Treaty Organization. Support commences prior to launch and in most cases, continues throughout the life of the satellite to include recovery, if required. A complex instrumentation system consisting of antennas, communications, and data processing equipment provides the ground support capabilities for the many space vehicles. The RDT&E appropriation provides for the development, installation and modification of network components to meet evolving satellite program support requirements. These efforts either correct system deficiencies or allow for increased program support.

Program Element: #35110F | Title: Satellite Control Facility
DOD Mission Area: #410, Space Launch and Orbital Support | Budget Activity: #6, Defense-wide Mission Support

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) (U) FY 1982 ACCOMPLISHMENTS: In FY 1982, the network supported an average of 46 satellites on-orbit simultaneously. This average is continuing to increase as is the overall Satellite Control Facility (SCF) workload which is expected to increase 9% by 1983. This expanding workload is primarily the result of the lengthened satellite on-orbit lifetimes, the increasing complexity of spacecraft and space operations, and support of Space Transportation System (STS) launches. The SCF supported two STS Orbital Flight Tests in FY 82 including the first DOD STS payload. Data System Modernization (DSM) development proceeded successfully with completion of 29% of the new software and creation of a Software Development Lab which can be configured as a prototype Mission Control Complex for end-to-end software development and testing. Facility construction to support operations of a new classified satellite program which will use DSM equipment is progressing.

(2) (U) FY 1983 PROGRAM: The Satellite Control Facility will continue the planning, development, acquisition, operation and maintenance of systems necessary to support the needs of current and planned space programs. Satellite recovery equipment and mission control center modifications dictated by satellite program requirements will continue. The DSM development/acquisition contract will continue. Facility construction and modification to support operations of equipment associated with DSM will begin.

(3) (U) FY 84 PLANNED PROGRAM AND BASIS FOR FY 1984 RDT&E REQUEST: Ongoing efforts to meet evolving satellite program requirements will continue. The most significant portion of the FY 1984 RDT&E will be the software development, test and integration for the first operational user of DSM equipment. In the outyears, to enhance the survivability of the AF Satellite Control Network while meeting projected workload requirements, two additional TT&C antennas will be added to the SCF which will be interoperable with the DMSP and GPS ground control antennas. The first step beginning in FY84 is the development of an Automated Remote Tracking Station (ARTS) which uses the DSM remote status and control capabilities. The ARTS will reduce O&M costs compared to current RTS operations by reducing operations personnel and by using state-of-the-art, high reliability electronic components.

(4) (U) PROGRAM TO COMPLETION: This is a continuing program.

C. MAJOR MILESTONES:

Milestone	Date
DSM Contract Award	Dec 80
DSM Military Construction	Mar 83
DSM DT&E	Oct 83
ARTS Contract Award	Jan 84
DSM OT&E	Jan 85
DSM IOC	Mar 85
Thule/DMSP Antenna IOC	Dec 85
DSM FOC	Feb 87

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FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #35119F
DOD Mission Area: Space Launch and Orbital Support, #410

Title: Space Boosters
Budget Activity: Defense-wide Mission Support, #6

1. (U) RESOURCES (PROJECT LISTING)($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	19,428	15,011	15,596	12,950	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The need exists to continue to provide a highly reliable means of placing critical Department of Defense satellites into their required mission orbits until the Space Shuttle becomes fully operational and all satellite programs have completed transition to the Space Shuttle. This program meets this need by providing for the engineering support and flight performance assessment of the Department of Defense Atlas and Titan III space launch vehicles which are a part of the national launch vehicle family. This program also provides the resources for the Titan III(34)D/Inertial Upper Stage integration, for integration of the Transtage onto the Titan III(34)D, and for Atlas-E launches of Air Force Research and Development satellites.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
RDT&E	19,228	15,011	10,623	TBD	Continuing	Not Applicable
Procurement (Missile)	68,217	71,100	167,200	TBD	Continuing	Not Applicable

Changes in RDT&E estimates reflect an additional RDT&E funded launch in FY 1984, minor updates of cost estimates and revised inflation indices. Missile procurement estimates have been revised downward in FY 84. This reflects Air Force expectations that continued Shuttle success will allow us to end Titan III booster production. The decision to end Titan III production will be made in mid-FY 1983 following the successful completion of the sixth Space Shuttle mission (STS-6).

Program Element: #35119F
DOD Mission Area: Space Launch and Orbital Support, #410

Title: Space Boosters
Budget Activity: Defense-wide Mission Support, #6

4. (U) OTHER APPROPRIATION FUNDS:

	FY 1982	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Procurement (Missile)	67,050	70,700	0	25,290	Continuing	Not Applicable
(Quantity - Titan III(34)D)	(2)*	(2)*				
Operation and Maintenance	71,182	75,927	82,722	86,812	Continuing	Not Applicable

* Advance buy in FY 1982 and FY 1983. Production funding responsibility for the two Titan III(34)D vehicles for which advance buy materials were bought by this Program Element in FY 1982 was assumed by PE 34111F. Production funding for the two Titan III(34)D vehicles, for which advance buy materials are being bought in FY 1983, would be provided by this Program Element; however, the vehicles would be delivered only if required by major problems in the Space Shuttle affecting its ability to support DOD launches or by a change in policy on maintaining an expendable launch vehicle capability. Consequently, no FY 84 production funding is requested since we expect STS-6 to be successful. Should major Shuttle problems develop, booster funding would be requested by budget amendment or reprogramming.

5. (U) RELATED ACTIVITIES: Major Department of Defense and National Aeronautics and Space Administration space systems which employ the Atlas and Titan III boosters include: classified space programs; Defense Satellite Communications System, Program Element 33110F; Satellite Data System, Program Element 35158F; Defense Meteorological Satellite Program, Program Element 35160F; Defense Support Program, Program Element 12431F; NAVSTAR Global Positioning System, Program Element 64778F; Navy Geodetic Satellite; and the National Aeronautics and Space Administration/National Oceanic and Atmospheric Administration meteorological satellite program. This program funds modifications to the Inertial Upper Stage, which is being developed by Program Element 64411F, to allow it to be flown as an upper stage on the Titan III.

6. (U) WORK PERFORMED BY: Responsible Air Force agency is the Air Force Systems Command Space Division, Los Angeles, CA. Systems Engineering is provided by Aerospace Corporation, El Segundo, CA. Titan III contractors include: Martin Marietta Corporation, Denver, CO (integration, core vehicle, Transtage); Aerojet Liquid Rocket Company, Sacramento, CA (liquid propulsion system); United Technology Corporation-Chemical Systems Division, Sunnyvale, CA (solid rocket motors); Delco Electronics Division, Goleta, CA (inertial guidance); Western Electric Company, Winston Salem, NC (radio guidance) and McDonnell-Douglas Astronautics Company, Huntington Beach, CA (payload fairing). Atlas contractors include: General Dynamics - Convair, San Diego, CA (integration and airframe); Rocketdyne, Canoga Park, CA (liquid propulsion systems); General Electric, Syracuse, NY (guidance). The upper stage contractors include: Boeing Space Division, Seattle, WA (Inertial Upper Stage); McDonnell-Douglas Astronautics Company, Huntington Beach, CA (Improved Stage Vehicle System); and Lockheed Missiles and Space Company, Sunnyvale, CA (Agena). (Funding for some activities managed by the Space Boosters program is provided from user budgets). There are several additional contractors supplying Titan III and Atlas components.

Program Element: #35119F
DOD Mission Area: Space Launch and Orbital Support, #410

Title: Space Boosters
Budget Activity: Defense-wide Mission Support, #6

7. (U) PROJECT LESS THAN $10 MILLION IN FY 1984:

Not Applicable

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: Space Boosters, PE 35119F (SINGLE PROJECT FOR PROGRAM ELEMENT)

A. (U) Project Description:

The Department of Defense family of space boosters (Atlas, Thor, Titan III) was developed to provide a versatile capability (up to 29,200 pounds in low earth orbit-Titan IIIC) for meeting projected national launch requirements. While the family still includes two surplus ballistic missiles (the Atlas-E and Thor vehicles), the primary boosters are considerably improved standardized versions of the original missile configurations. This Program Element provided for development of the Titan IIIC Space Launch Vehicle and provides continuing support for the Atlas and Titan III launch vehicles. The boosters supported by this program are:

Atlas-E - refurbished Atlas Intercontinental Ballistic Missile (ICBM), radio guided, liquid rocket engine, stage and one-half booster.

Titan IIIB - modified Titan II first and second stages with liquid rocket engines (core vehicle) flown with an Agena upper stage and either radio or inertial guidance.

Titan IIIC - core vehicle with a storable liquid propellant, inertially guided upper stage (Transtage) plus two 5 segment 120-inch diameter strap-on solid rocket motors. The final Titan IIIC was launched in March 1982.

Titan IIID - core vehicle with two 5 segment 120-inch diameter strap-on solid rocket motors and radio guidance.

Titan III(34)D/Inertial Upper Stage - Titan IIID modified for use with the Inertial Upper Stage; core vehicle with two 5-1/2 segment 120-inch strap-on solid rocket motors and which is guided by the Inertial Upper Stage guidance system; flown only at Cape Canaveral Air Force Station FL.

Titan III(34)D - radio guided version of the Titan III(34)D which is flown without the Inertial Upper Stage and is flown only at Vandenberg Air Force Base, CA.

Titan III(34)D/Transtage - Titan III(34)D flown with the Transtage replacing the Inertial Upper Stage; guidance provided by the Transtage inertial guidance system; flown only at Cape Canaveral Air Force Station, FL.

Program Element: #35119F — Title: Space Boosters

DOD Mission Area: Space Launch and Orbital Support, #410 — Budget Activity: Defense-wide Mission Support, #6

The program includes post flight analysis of Research and Development (R&D) components; study, modification, redesign and test of components as a result of deficiencies identified during vehicle systems test and flight; evaluation and improvement (where warranted) of mission reliability; component reliability improvement to prevent launch vehicle failures and analysis support and development planning for new missions. To take advantage of the investment in the Inertial Upper Stage reliability, a program was initiated in FY 1977 to correct Titan III reliability deficiencies through the integration of the Inertial Upper Stage and its technology into the Titan III Space Launch Vehicle family. The Titan III(34)D/Inertial Upper Stage improves the current Titan IIID, replaces the Titan IIIC Space Launch Vehicles and reduces the number of nonstandard Titan III components. In addition to increasing the Titan III launch reliability, the Titan III(34)D/Inertial Upper Stage increases Space Shuttle transition flexibility and reduces the Space Shuttle backup launch capability cost. The program also provides for integration of the Transtage onto the Titan III(34)D to assure the ability to launch critical Department of Defense missions if major technical problems are encountered in the initial Inertial Upper Stage flights. The program also provides for Atlas-E launches of certain Air Force Research and Development satellites until they transition to the Shuttle.

B. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE EFFORTS:

(1) (U) FY 1982 Accomplishments: The Titan III(34)D/Inertial Upper Stage integration effort was completed to support an initial Launch Capability at Cape Canaveral Air Force Station, FL, in October 1982. Titan III(34)D configuration is launch-ready at Vandenberg Air Force Base, CA; the first launch will occur when payload requirements dictate. Integration of the Transtage onto the Titan III(34)D continued to support an Initial Launch Capability at Cape Canaveral Air Force Station, FL, in FY 1983. The basic Titan III and Atlas reliability maintenance, flight assessment, vendor qualification, and component/subsystem replacement efforts continued. The primary reliability maintenance effort continued to be the restoration of the reliability of the Atlas-E liquid rocket engines through overhaul and testing. The effect of small launch vehicle procurements continued to increase problems with retaining vendors of critical components of both the Titan III and Atlas-E launch vehicles. This required increased efforts to qualify new sources of existing materials/components or to redesign vehicle subsystems to incorporate replacement materials/components. One Atlas-E launch for a NAVSTAR Global Positioning System Research and Development mission was performed, but was a failure due to a rocket engine failure.

(2) (U) FY 1983 Program:
The first launch of the Titan III(34)D Inertial Upper Stage was highly successful and placed two satellites very precisely into their desired mission orbits. The basic Titan III and Atlas reliability maintenance, flight assessment, vendor qualification and component/subsystem replacement efforts will continue. Integration of the Transtage onto the Titan III(34)D will be completed. Two Atlas-E launches for NAVSTAR Global Positioning System Research and Development missions are planned. The FY 1983 Missile Procurement funds provide for the procurement of advance buy materials for two Titan III(34)D backup vehicles, which will allow extension of the maintenance of critical Titan III production capabilities beyond September 1983 if required by further delays in Space Shuttle development or operational availability. The decision whether to procure these materials will be made follow completion of the sixth Space Shuttle flight. The Missile Procurement funds also provide for the procurement of propellants for Titan III(34)D backup vehicles. Funding for the production of the two Titan III(34)D vehicles, for which advance buy materials were procured in FY 1982, will be provided by PE 34111F.

Program Element: #35119F   Title: Space Boosters
DOD Mission Area: Space Launch and Orbital Support, #410   Budget Activity: Defense-wide Mission Support, #6

(3) (U) FY 1984 Planned Program: The basic Titan III and Atlas reliability maintenance, flight assessment, vendor qualification, and component/subsystem replacement efforts will continue. One Atlas-E launch for a NAVSTAR Global Positioning System Research and Development mission is planned. The FY 1984 Missile Procurement funds will provide production support for backup Titan III(34)D vehicles and for initial phaseout of Titan III production capability. Additional Titan vehicles beyond those now on contract will be produced only if required by major problems in the Space Shuttle affecting its ability to support DOD launches or by a change in policy on maintaining an expendable launch vehicle capability. Should unexpected problems develop with the Shuttle that require procurement of additional Titan vehicles, we will submit an amended budget or reprogramming request as appropriate.

(4) (U) Program to Completion: This is a continuing program. The basic Titan III and Atlas reliability maintenance, flight assessment, vendor qualification, and component/subsystem replacement efforts will continue until phaseout of the Titan III and Atlas vehicles is complete. The program will continue to require funds from other appropriations to support operational Titan III and Atlas launches, to provide the required expendable launch vehicle backup to the Space Shuttle, to maintain critical Titan III production capability, and to phaseout certain Titan III configurations.

C. (U) Milestones:

1.	Start Titan III(34)D/Inertial Upper Stage Integration		June 1977
2.	Space Shuttle backup launch vehicle procurement		December 1977
3.	Titan III(34)D Initial Launch Capability at Vandenberg AFB, CA		December 1981
4.	Titan III(34)D/Inertial Upper Stage Initial Launch Capability at Cape Canaveral AFS, FL	*(September 1982)	October 1982
5.	Titan III(34)D/Transtage Initial Launch Capability at Cape Canaveral AFS, FL		December 1982
6.	Initiate Titan III production phase down	*(October 1982)	April 1983

*Dates presented in Fiscal Year 1982 Descriptive Summaries.

(U) EXPLANATION OF MILESTONE CHANGES

4. Additional time required to resolve minor technical issues on launch pad. First launch was highly successful

6. The sixth Space Shuttle flight (STS-6) will carry an Inertial Upper Stage and a full 5000 pound payload, the Tracking and Data Relay Satellite. The success of this mission will indicate that Shuttle can meet DOD launch requirements from the Kennedy Space Center. Production phase out of the Titan III(34)D will begin following successful completion of this mission.

Budget Activity: Defense Wide Mission Support, #6
Program Element: #35119F, Space Boosters

Test and Evaluation Data

1. (U) Development Test and Evaluation: In June 1977, the Assistant Secretary of the Air Force for Research, Development and Logistics formally approved the initiation of a program to integrate the Inertial Upper Stage into the Titan III family. This approval was based upon successful completion of a review by the Air Force Systems Acquisition Review Council of the integration program, the concurrence of the Deputy Secretary of Defense, and the prior approval by Congress of an FY 77 reprogramming request to initiate the program. Benefits projected to be derived from the Titan III (34)D/Inertial Upper Stage integration were: increased reliability, increased payload capability, reduction in launch vehicle configurations, mission model flexibility, and reduced total program cost. The Air Force Systems Command Space Division is responsible for management of the Titan III(34)D/Inertial Upper Stage integration program. Participating contractors are: (1) Martin-Marietta Denver Aerospace Company, Denver, Colorado; Boeing Aerospace Division, Seattle, Washington; Chemical Systems Division of United Technologies, Sunnyvale, California; Aerojet Liquid Rocket Company, Sacramento, California; and McDonnell-Douglas Astronautics, Huntington Beach, California. The Arnold Engineering Development Center, Tullahoma, Tennessee, provides test support to this program.

(U) The Titan III(34)D/Inertial Upper Stage development was completed with a nearly flawless first launch at 0405GMT on 30 October 1982 from Launch Complex 40 at Cape Canaveral AFS, FL. The Titan III(34)D/Inertial Upper Stage injected its payloads into extremely precise final geosynchronous orbits.

(U) Testing of Titan III changes required to integrate the Inertial Upper Stage into the Titan III Space Launch Vehicle family consists of structural and electronic ground testing. Structural test provisions include testing of all new and modified hardware. Structural test items for this configuration include a modified Stage II equipment truss, a new design Stage II adapter skirt, an additional solid rocket motor half-segment, a new design Titan III(34)D-to-Inertial Upper Stage support truss, and a modified payload fairing. Additional structural testing was also required on the existing Stage I long core section. Tests of the Inertial Upper Stage avionics/Titan III(34)D electronics interface were required to insure system compatibility. Inertial Upper Stage separation and shock testing were provided to insure Inertial Upper Stage compatibility with the Titan III interface. The Failure Modes and Effects Analysis for the Titan III was updated to reflect all changes resulting from the Titan III(34)D/Inertial Upper Stage integration.

(U) Inertial Upper Stage separation and shock testing was completed in November 1978 and demonstrated that the actual shock spectrum was less than design specification. The Titan III(34)D/Inertial Upper Stage configuration structural qualification testing was initiated in April 1980 and was completed in September 1980. In October 1979, the second and last full-scale static firing of the 5&1/2 segment, 120 inch diameter Solid Rocket Motor was successfully completed, demonstrating the flight-worthiness of the 5&1/2 segment motor and the new nozzle throat material. In April 1979, the Stage I fuel tank tests were successfully completed, thus verifying that the "stretched" Stage I fuel tank used on the Titan IIIB

Budget Activity: Defense Wide Mission Support, #6
Program Element: #35119F, Space Boosters

can withstand the Titan III(34)D/Inertial Upper Stage flight environment. Successful completion of payload fairing separation tests verified proper separation of the modified payload fairing from the vehicle. Joint Titan III(34)D/Inertial Upper Stage electronics interface testing was completed in 1982. Development of the Inertial Upper Stage under Program Element 64411F is complete.

(U) The Inertial Upper Stage program entered full scale development in March 1978 with Initial Launch Capability for the Inertial Upper Stage for both the Shuttle and Titan III applications scheduled for July 1980. However, changes in Space Shuttle interface requirements combined with a series of technical problems during the development resulted in delay in the Initial Launch Capability for the Titan III(34)D/Inertial Upper Stage from July 1980 to October 1982. Critical Design Review of the Inertial Upper Stage was initiated in February 1979 and completed in November 1979.

(U) Inertial Upper Stage propulsion system development testing has been completed. To date, seven solid rocket motor cases have been burst tested and four cases have been skirt tested. Motor case development and verification have been successfully completed. Motor case efficiency is at the state-of-the-art level, and case burst data show little scatter. Skirt ultimate loads have been demonstrated four times. In addition to the four full scale nozzle firing tests, six large and seven small Inertial Upper Stage motors (including one spin motor) have been successfully fired at the Arnold Engineering and Development Center, TN. Two motor firings included the Extendable Exit Cone (deployed prior to the test). The ability to fire Inertial Upper Stage solid rocket motors for the Titan III(34)D application was also demonstrated during these development firings. Two large and two small motors of the total of thirteen fired had propellant offloads (large motor: 50% and 60% offloads; small motor: 50% and 22% offloads). These firings completed the motor development program. In the qualification program, one burst test and twelve additional motor (six small and six large) firings will be conducted. The firings began in November 1981 with the successful firing of the first large motor. The qualification program for the Titan configuration was completed in September 1982 and will continue through December 1982 for the Shuttle configuration. The problem of propellant cracking in the boot area of the solid rocket motor has been solved as confirmed by cold X-rays of four qualification motors (two of each size).

(U) Component qualification testing of line replaceable units for the Inertial Upper Stage (Titan III(34)D application) began in August 1979, and all forty components have successfully completed qualification. The last flight component completed qualification in November 1981. Structural qualification of the Titan III(34)D-configured Inertial Upper Stage was completed in September 1980 with successful accomplishment of separation systems, acoustics and pyrotechnic shock tests. Structural qualification of the Space Transportation System configuration started in September 1981 and was completed in December 1981. These tests confirmed the system's ability to function in the specified vibration, pyro-shock, and thermal-vacuum environments.

(U) Titan III(34)D/Inertial Upper Stage flight software was a pacing item but has been successfully completed. The flight software was developed by TRW and tested at the Boeing Aerospace facility in Kent, WA. The operational flight software verification and validation testing for the first Titan III(34)D flight was performed at Boeing Aerospace, with independent verification and validation of the software performed by the Martin-Marietta Denver Aerospace Company. The

Budget Activity: Defense Wide Mission Support, #6
Program Element: #35119F, Space Boosters

operational flight software and mission data load for the first payload program on the Titan III(34)D/Inertial Upper Stage performed superbly during the 30 October 1982 first launch. Completion of the development and validation of flight software for the second payload program on the Titan III(34)D/Inertial Upper Stage is scheduled for the first quarter of calendar year 1983.

(U) The Pathfinder Test Vehicle, a full-up, non-flight Inertial Upper Stage, was used with the Titan III(34)D at Cape Canaveral Air Force Station to validate the facility, aerospace ground equipment, and test procedures. This greatly simplified launch preparations with the actual flight hardware and contributed to the very highly successful first launch.

(U) The Inertial Upper Stage is also used on the Space Shuttle; that application is covered in the Test and Evaluation Data for Program Element 64411F, Space Shuttle. The first Inertial Upper Stage for use on the Shuttle completed acceptance testing in October 1981 and is awaiting launch on STS-6, with the NASA Tracking and Data Relay Satellite, in January 1983.

2. (U) Operational Test and Evaluation: Since Titan III is a mature program with no major changes scheduled, there is no requirement for a dedicated Air Force Test and Evaluation Center (AFTEC) OT&E program. Design and operational requirements are well understood, and mechanisms exist to handle ongoing assessments and system changes. Specific program Space Booster support will be addressed under other OT&E programs. IUS OT&E is covered under Program Element 64411F.

3. (U) System Characteristics (Titan III(34)D/Inertial Upper Stage Combination):

	OBJECTIVE	CURRENT ESTIMATE	DEMONSTRATED
Low Earth Orbit Missions (No Inertial Upper Stage)			
Payload Capability (pounds)			
100 nautical mile altitude-10 foot Payload Fairing, East launch from Cape Canaveral Air Force Station, Florida	32,800	32,800	32,800
100 nautical mile (polar orbit)-10 foot Payload Fairing, launch from Vandenberg Air Force Base, California	27,600	27,600	27,600 **
Synchronous equatorial orbit missions (with Intertial Upper Stage)			
Payload Capability (pounds)			
10 foot Payload Fairing	4,000	4,000	3,900
Cape Canaveral Air Force Station, Florida		4,200*	TBD
Reliability	97%	98%	100%

NOTE: (U) Due to the development of the Titan III(34)D from the existing Titan III family and the small number of systems, availability and maintainability objectives have not been specified for the Titan III(34)D.

*(U) With Extendable Exit Cone on second stage. **(U) Based on empirical performance data from ETR.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #35130F | Title: Consolidated Space Operations Center
DOD Mission Area: #410 Space Launch and Orbital Control | Budget Activity: #6 Defense-wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ in Thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	18,422	28,000	72,677	73,946	266,944	463,770

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Consolidated Space Operations Center (CSOC) consists of two elements: the Satellite Operations Complex (SOC) and the Shuttle Operations and Planning Complex (SOPC). The need for the satellite control capability is based on the vulnerability of the Satellite Test Center (STC) in Sunnyvale, CA, a single node in the satellite control network which provides tracking, telemetry, and command capabilites to satellites supporting various national security missions. The STC is vulnerable to both environmental and man-made threats and has limited growth potential. The need for the Shuttle control capability stems from the planned reliance on the Space Shuttle for DOD missions. The DOD Shuttle control capability at Johnson Space Center (JSC) does not meet all DOD requirements for planning and conducting DOD missions. The capacity at JSC is limited to 6 to 8 secure DOD flights per year, security is limited to SECRET, and military and civil space operations are intermingled. JSC is also a single node, subject to hostile actions and environmental hazzards. CSOC overcomes these limitations by providing: a secure environment from which to conduct DOD space missions; siting to minimize environmental and man-made threats; adequate capacity to support the national Shuttle traffic model; and the capability to conduct military space operations from dedicated DOD facilities allowing close coordination of Shuttle and satellite operations.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in Thousands)

RDT&E	19,427	32,116	59,328	64,374	229,597	408,623
PROCUREMENT (OTHER)	0	20,736	83,190	167,630	364,914	636,470

FY82 - RDT&E decrease by $1M due to Air Force reprogramming action which resulted in a reduction in the NASA level of effort on SOPC definition studies.

FY83 - RDT&E decrease by $4.1M due to Congressional appropriation cut.

FY84 - RDT&E shows added funds needed for activation planning and training systems; better definition of subsystem acquisition costs derived from contractor and NASA studies is also reflected.

Total Estimated Cost - The cost estimating activity has also indicated a more appropriate allocation of funds between RDT&E and procurement. The shift of funds from procurement to RDT&E is reflected in FY 85 and the cost to complete figures.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #35130F
DOD Mission Area: #410 Space Launch and Orbital Control

Title: Consolidated Space Operations Center
Budget Activity: #6 Defense-wide Mission Support

4. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
PROCUREMENT (OTHER)	0	20,736	80,276	172,456	268,177	541,645
MILITARY CONSTRUCTION	0	67,700	75,000	0	0	142,700
OPERATIONS AND MAINTENANCE	0	0	7,690	25,944	Continuing	Continuing

5. (U) RELATED ACTIVITIES: The CSOC will become an integral part of the Air Force Satellite Control Network. The Satellite Control Facility Data System Modernization project, funded under PE 35110F, contains contractual options to provide the CSOC satellite control complement of equipment. An interim DOD Shuttle control capability is now being established as the JSC Controlled Mode under PE 63411F, 64411F and 12449F. The CSOC Shuttle operations complement of equipment will be evolved from NASA systems and the operational experience gained at the Johnson Space Center. PE 35151F, Satellite Control Facility Communications, includes operations and maintenance funds for CSOC communications. The DOD Shuttle operations cadre, the Manned Space Flight Support Group, has been established at JSC under PE 35171F.

6. (U) WORK PERFORMED BY: HQ Space Division, Los Angeles AFS, CA (System Program Office)
Air Force Regional Civil Engineer, Dallas, TX (Facilities)
TRW, Inc., Redondo Beach, CA (System Integration)
Aerospace Corporation, El Segundo, CA (System Engineering)
NASA, Johnson Space Center, Houston, TX (Shuttle Systems Definition)

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable.

8. (U) PROJECT OVER $10 MILLION IN FY 1984:

(U) Project: Consolidated Space Operations Center

A. (U) Project Description: The CSOC will be developed and activated in several phases. Each phase will result in an increment of added operational capability. The facility construction is planned for completion in August 1985. The installation of a minimum satellite control capability and the accompanying communications interfaces will provide a satellite emergency back-up capability by April 1986. The first full satellite mission control center will be operational in November 1986. The remaining satellite mission control centers will be sequentially activated during 1987. To support the Shuttle flight schedule as reflected in the national Shuttle mission model, the CSOC Shuttle Flight Planning Element will be operational in 1987. The Shuttle Flight Readiness and Flight Control elements will be activated in time to provide a full year of crew training, rehearsals, and active flight following (in parallel with NASA operations in order to validate CSOC operational readiness prior to the first CSOC controlled Shuttle flight.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #35130F
DOD Mission Area: #410 Space Launch and Orbital Control

Title: Consolidated Space Operations Center
Budget Activity: #6 Defense-wide Mission Support

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Facility design advanced to the 60% completion milestone. A joint Air Force/NASA design definition study for the SOPC was initiated at Johnson Space Center. Design of the SOC systems proceeded under an Air Force Satellite Control Faciltiy (AFSCF) contract and 30% of the SOC software was completed. TRW was awarded a contract to provide CSOC system integration support services.

(2) (U) FY 1983 Program: Facility design work will be completed and a contract for the first phase of facility construction (site preparation) will be awarded. The SOPC design definition will be completed and the SOPC Segment specifications will be finalized. SOC software development will continue. A contract for the Communications Segment will be awarded.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: A contract for the second phase of facility construction (buildings) will be awarded. A competitive source selection will be conducted for the acquisition of the SOPC technical systems. The initial SOC technical systems will be acquired through the AFSCF contract. Development of the communications systems will continue. The crew training program will accelerate with the development of course materials and procurement of training equipments becoming major efforts in FY 1984. The RDT&E request is based on estimates provided by HQ AFSC. These estimates are derived from program office analyses, NASA cost projections and existing contract options. Changes from the FY83 Descriptive Summary include updated estimates based on the results of the Air Force/NASA SOPC analysis and contracted definition efforts for the training program. In general, refined program definition has shown that more development and less procurement will be necessary. The restructured program shows earlier starts required for some development efforts than were previously projected when only procurement was envisioned.

(4) (U) Program to Completion: Facility construction, equipment development, and operational training will continue in FY 1985. Facility occupancy is currently projected for August 1985 with initial satellite control capability in late 1986 and initial Shuttle operational flight planning starting in late 1987. The remaining satellite mission control complexes are planned for installation by late 1987 and an initial Shuttle mission control capability is projected for the late 1980s to support the national Shuttle mission model. A second Shuttle flight control room plus additional Shuttle simulator system capability for crew training and flight validation are proposed for the early 1990s.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #35130F
DOD Mission Area: #410 Space Launch and Orbital Control

Title: Consolidated Space Operations Center
Budget Activity: #6 Defense-wide Mission Support

C. (U) Major Milestones:

Milestones	Dates
1. Mission Element Need Statements Validated	September 1979
2. Environmental Impact Analysis Filed	February 1981
3. Site Selection Announcement	March 1981
4. Military Construction Program Submission	January 1982
5. Military Construction Program Approval	October 1982
6. Facility Occupancy Date	August 1985
7. Satellite Emergency Backup Capability	April 1986
8. First Satellite Mission Control Center Operational	November 1986
10. Shuttle Planning Element Operational	November 1987

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: 35160F Title: Defense Meteorological Satellite Program
DOD Mission Area: Space Launch and Orbital Support, #410 Budget Activity: Defense Wide Mission Support, #6

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	43,523	25,385	26,570	50,842	Continuing	N/A

2. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Defense Meteorological Satellite Program (DMSP) provides visual and infrared cloud cover data and other meteorological, oceanographic, and solar-geophysical information. These data are required over the entire surface of the earth in support of strategic and tactical missions. At least [ ] satellites are required in polar orbit at all times; [ ] data in the early morning and early evening, [ ] during mid-day and mid-night. Program requirements were revalidated by the Joint Chiefs of Staff on 5 October 1981. The MAJCOM CINCs continue to strongly state their requirement for an operational DMSP in their semiannual SITREPS (situation reports). This Program Element provides the satellites and sensors, ground command and control, Air Force mobile tactical ground terminals, O&M, and booster modifications.

3. (U) COMPARISON WITH FY 83 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Costs
RDT&E	47,222	27,751	35,370		Continuing	N/A
Missile Procurement	36,616	167,900	34,800		Continuing	N/A
Other Procurement	1,833	6,327	11,371		Continuing	N/A

RDT&E FY 82 funding reduced $2200K due to a lower than anticipated settlement of a contingent liability. FY 83 funds reduced by $2366K to support other high priority Air Force programs. FY 84 funding reduced due to change in Space Shuttle transition from FY 85 to FY 89/90 - RDT&E development of Shuttle compatible satellite changed to FY 85 start due to the directed addition of 4 expendable booster launched satellites being procured with a multiyear procurement in FY 83/85.

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
Missile Procurement	36,550	166,800	33,908	147,393	Continuing	N/A
Quantity (Satellites)	0	2	0	3	Continuing	N/A
Other Procurement	185	6,327	11,261	22,788	Continuing	N/A
Operation and Maintenance	13,301	15,280	26,103	27,063	Continuing	N/A

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Program Element: 35160F | Title: Defense Meteorological Satellite Program
DOD Mission Area: Space Launch and Orbital Support, #410 | Budget Activity: Defense Wide Mission Support, #6

5. (U) RELATED ACTIVITIES: The Defense Meteorological Satellite Program is a joint-Service program in accordance with the Memorandum of Agreement on Joint Service Management and Operations, dated 15 December 1976. The program supports all military services. Based on the successful operation of an experimental receiving terminal aboard the U.S.S. Constellation, the Navy is equiping all large carriers to receive data and is operating two shore based terminals to receive data. The Air Force began procurement of new tactical terminals in FY 1978 with the acquisition of 1 RDT&E model and 3 production models that have been operationally deployed. Air Force follow-on production procurement of 12 terminals will begin in FY 84. The Marine Corps has procured 1 RDT&E model and began production procurement in FY 82. Navy personnel are integrated into the Program Office to insure compatability between the Air Force satellites and the receiving and data processing equipment of the Navy and Marine Corps. Personnel from the Army's Atmospheric Sciences Lab are coordinating Army matters with the Program Office. Close coordination is also maintained with the civilian weather satellite program operated by the Department of Commerce. The two systems have different primary missions and different primary sensors. Cloud imagery is the primary Defense need, while vertical temperature soundings are the primary Commerce need. Interchange of technology has been continuous, with special emphasis on avoiding duplication of effort. Pursuant to a study directed by the Office of Management and Budget, Commerce decided in January 1974 to adopt the Defense spacecraft design, the Block 5D, as a basic spacecraft bus for the civil system. Atlas E launch services for the Defense Meteorological Satellite Program are provided by the Space Boosters Program (Program Element 35119F). Leased communications are provided for the DMSP command and control element by DMSP Communications (PE 35162F). The DMSP and the Air Force Satellite Control Facility (PE 35110F) will cooperate to install an interoperable telemetry, tracking, and control (TT&C) antenna at the Thule Remote Tracking Station, provide a backup control center for the 4000th Satellite Operations Group, and close the Loring AFB Command Readout Station.

6. (U) WORK PERFORMED BY: Development and procurement are managed by the Space Division, Los Angeles, CA. The Air Force Geophysics Laboratory, Hanscom AFB, Bedford, MA; the Aerospace Corporation, El Segundo, CA; and the Navy's Environmental Prediction Research Facility, Monterey, CA, all contribute to the DMSP satellite meteorology development program. Contractors include: RCA, Princeton, NJ (spacecraft and satellite integration); Westinghouse Electric Corporation, Baltimore, MD (primary imaging sensor and ground display equipment); Hughes Aircraft Company, Los Angeles, CA, Barnes Engineering Company, Stamford, CT, Aerojet Electro-Systems, Azusa, CA, and Sandia National Laboratories, Albuquerque, NM (mission sensors); Harris Corporation, Melbourne, FL (ground command and control and mobile ground data processing terminals); General Dynamics Convair, San Diego, CA (launch vehicle); and American Satellite Corporation, Rockville, MD (commercial communications data relay for PE 35162F).

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 84: N/A

8. (U) PROJECTS OVER $10 MILLION IN FY 84:

(U) Project: Defense Meteorological Satellite Program (entire PE is considered a single project)

A. (U) Program Accomplishments and Future Efforts:
(1) (U) FY82 Accomplishments: Efforts to design and modify the primary (imaging) sensor for Space Shuttle

compatibility were initiated. The satellite design was modified to allow the DMSP satellite to carry a microwave imaging sensor and to include command and telemetry encryption hardware. Design of the Satellite Data Handling System, intended to improve quality and timeliness of primary data, to satisfy mission requirements of Air Force Global Weather Central, was completed. Design efforts to improve producibility, decrease system test time, and increase on-orbit effectiveness of the Block 5D-2 satellite continued. The first Block 5D-2 satellite was delivered to the government and shipped to Vandenberg AFB and was successfully launched on 20 December 1982. Procurement of the Marine Corps' Mark IV transportable weather terminals was initiated.

(2) (U) FY 1983 Program: The development of the Shuttle qualified primary sensor will continue. The satellite reliability improvement program will continue. The program will begin the multiyear procurement with an economic order quantity advanced buy of four spacecraft and primary sensors. Parts and subassemblies for all four units will be procured in FY83 and the first two spacecraft and sensors will be assembled. (The second two will be assembled in FY85.) Integration of the microwave imager will continue. Four precipitating electron sensors will be procured. A contract for the design and production of the Hardcopy Imager Processing System will be awarded. This system is intended to provide weather "pictures", replacing old, unreliable, and potentially hazardous machines that currently are used. The second Block 5D-2 satellite will be delivered and launched.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: There are no new RDT&E efforts in FY84. DMSP will continue the design and production of a Shuttle qualified primary (imaging) sensor. By FY84, all parts will have been received and the assembly and test of the unit will have begun. The satellite reliability and design improvement effort, started in FY82, will be through the design phase, parts will be in test and qualification for incorporation on the DMSP satellite. The ground command and control system will be upgraded to minimize data handling time and improve hardcopy and operator video displays to improve real-time telemetry analysis and anomaly resolution. Designs for including command and telemetry encryption systems will be finalized. The costs for these efforts are defined in ongoing fixed price contracts.

(4) (U) Program to Completion: This is a continuing program. RDT&E funding will allow evolutionary development of spacecraft and sensors as necessary to support new requirements of the special strategic missions, the Joint-Service mission, and the Joint Chiefs of Staff. The program will begin development of a Shuttle compatible spacecraft in FY85 with a transition to Shuttle in FY 89/90.

B. (U) Major Milestones:

	MILESTONES:	Date:
	Program Initiation	[ ]
	First Launch	[ ]
(U)	Contract Award for Block 5D Satellite	Feb 1972
(U)	First Launch of Block 5D Satellite	11 Sep 1976
(U)	Launch of First Block 5D-2 Satellite	20 Dec 1982

Program Element: 35160F
Mission Area: Space Launch and Orbital Support, #410

Title: Defense Meteorological Satellite Program DOD
Budget Activity: Defense Wide Mission Support, #6

(U)	Development of Shuttle Qualified Primary Sensor	FY 1982-86
(U)	Development of Shuttle Qualified Spacecraft	FY 1985-89
(U)	First Launch from Shuttle	FY 1989-90

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #35171F   Title: Space Launch Support
DOD Mission Area: Space Launch and Orbital Support, #410   Budget Activity: Defense-wide Mission Support, #6

1. (U) RESOURCES (PROJECT LISTING)($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	20,151	16,419	34,525	43,607	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides the Space Transportation System resources/ capability needed to transport Air Force space payloads into their mission orbits. The main program objective is to provide consolidated management, programming, and execution of the operational phase Air Force Space Shuttle, Inertial Upper Stage (IUS), and Payload Assist Module-Delta class (PAM-D) activities that are common to the Department of the Air Force research and development and operational satellite programs.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

RDT&E	20,151	16,419	40,346		Continuing	Not Applicable
Procurement (Missile)	102,975	155,800	172,400		Continuing	Not Applicable

The decrease in FY 1984 RDT&E funds is due to a mission model change which reduced the Orbiter Flight Charge (OFC) requirements for a Space Test Program sortie mission. The decrease in FY 1982 Missile Procurement funds is the result of an IUS reprogramming requirement which was less than originally anticipated. The decrease in FY 1984 Missile Procurement funds is the result of a change in IUS procurement plans caused by NASA termination of IUS vehicles.

4. (U) OTHER APPROPRIATION FUNDS:

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Estimated Costs
Procurement (Missile)	68,600	152,700	140,190	258,815	Continuing	Not Applicable*
(Order Quantity/Full Fund)						
(Inertial Upper Stages)	(0)	(0/2)	(0/0)	(8/0)		
(Payload Assist Modules-Delta class)	(0)	(28/0)	(0/1)	(0/6)		
Operation and Maintenance	62,303	173,743	353,297	658,102	Continuing	Not Applicable

* Includes spares.

Program Element: #35171F | Title: Space Launch Support
DOD Mission Area: Space Launch and Orbital Support, #410 | Budget Activity: Defense-wide Mission Support, #6

5. (U) RELATED ACTIVITIES: The IUS development, Department of Defense Space Shuttle operations capability development, and the acquisition of the Vandenberg Air Force Base Shuttle launch site are being accomplished in PE 64411F and PE 12449F. The research and development satellite programs supported include the Space Test Program, Program Element 63402F; and the first Space Shuttle mission of each of the following programs: the Defense Meteorological Satellite Program, Program Element 35160F; and the MILSTAR Satellite Communications Program, Program Element 33603F. Resources are provided in the outyears to support other systems in conceptual development. The operational satellite programs supported are the Defense Meteorological Satellite Program, Program Element 35160F; the Defense Satellite Communications System, Program Element 33110F; the Defense Support Program, Program Element 12431F; the NAVSTAR Global Positioning System (GPS), Program Element 35165F; the Satellite Data System, Program Element 35158F; and the MILSTAR Satellite Communications Program, Program Element 33603F. The individual Air Force payload programs will provide resources for program unique launch hardware and/or services. The resources for support to other Department of Defense programs are included in the appropriate Special Activity and Department of the Navy Program Elements.

6. (U) WORK PERFORMED BY: The responsible Air Force agency is the Air Force Systems Command's Space Division, Los Angeles, CA. Systems engineering is prov'ded by the Aerospace Corporation, El Segundo, CA. The IUS and spacecraft integration contractor is the Boeing Aer ce Company, Seattle, WA. The PAM-D contractor is the McDonnell-Douglas Astronautics Company, Huntington Beach, CA. The payload integration contractor is Martin Marietta Corporation, Denver, CO. The Vandenberg Air Force Base Shuttle operations contractor has not been selected. The National Aeronautics and Space Administration is the Space Transportation System manager and operates the national Space Shuttle eastern launch site at Kennedy Space Center, FL, and the mission control center at Johnson Space Center, TX.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984: Not Applicable

8. (U) PROJECTS OVER $10 MILLION IN FY 1984:

A. (U) Program Description: This program provides the launch support resources that are common to the Department of the Air Force research and development and operational satellite programs. This support includes procurement of the IUS, PAM-D and their associated launch services, payment of Orbiter Flight Charge reimbursements to the National Aeronautics and Space Administration, provision of mission control operations and recurring payload integration and operation of the national Space Shuttle launch site at Vandenberg Air Force Base, CA.

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: NASA was reimbursed for the remainder of the costs associated with terminating BATSON II on TDRSS. Mixed integration activities began for a Space Test Program sortie mission. The Manned Spaceflight Engineer (MSE) program was initiated to define and implement improved man-to-payload interfaces during on-orbit payload operations. This program provides support for payload specialists who fly on each Shuttle flight to insure the success of Air Force missions.

Program Element: #35171F	Title: Space Launch Support
DOD Mission Area: Space Launch and Orbital Support, #410	Budget Activity: Defense-wide Mission Support, #6

(2) (U) FY 1983 Program: An IUS for the first MILSTAR mission was procured (incrementally funded in FY 83, 84, and 85). Mixed cargo integration activities for a Space Test Program sortie mission will continue. Efforts will continue to develop and implement the MSE Program which enhances mission operations through the use of man during on-orbit payload operations.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The FY 1984 program will include payment of the OFC and mixed integration costs to support a Space Test Program sortie mission in FY 1985. FY 1984 funding is required for the second year of a three year, incrementally funded IUS vehicle procured in FY 1983. FY 1984 funding is also required to sustain the MSE Program. The IUS and OFC cost estimates are based upon firm prices from the contractors and NASA. Cost estimates for mixed integration and the MSE program were derived from contractor estimates and prior experience for similar efforts.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones:

Milestones	Dates
IUS DSARC II	March 1978
Long lead award, 1st IUS production contract	July 1980
First Shuttle Flight	April 1981
First DOD use of the Shuttle	June 1982
First Titan/IUS flight	October 1982
Shuttle Initial Operational Capability (IOC) at Kennedy*	November 1982
First Shuttle/IUS flight**	Spring 1983
PAM-D block buy contract	April 1983
First DOD operational Shuttle flight	November 1983
Shuttle IOC at Vandenberg AFB	October 1985

* NASA Milestone
** Civil Payload

Program Element: #71112F
DOD Mission Area: #473, Central Supply Activity

TITLE: Embedded Computer Systems Improvement Program
Budget Activity: 06, Defense Wide Mission Support

1. (U) RESOURCES: ($ in thousands)

	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
TOTAL FOR PROGRAM ELEMENT (RDT&E)	--	--	946	3,080	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program is an FY 84 new start. Provides contractual support for an AFLC effort to develop better support capabilities for embedded computer systems to avoid duplication, redundancy and improve productivity. The program will improve support to embedded computer systems through technical innovations, applied management techniques, standardization and more efficient information distribution. It impacts the support of every modern weapon system. AFLC'S critical mission need to support new logistics requirements for digital weapon systems is plagued with nonstandard support tools, is person-power intensive, has support systems that are system unique, has proliferation of hardware and software, has limited capability for reprogramming, and uses antiquated techniques for management and engineering of embedded computer support.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: Not Applicable.

4. (U) OTHER APPROPRIATION FUNDS:

	FY 1982	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Estimated Costs
Operation & Maintenance	--	--	1,500	3,100	Continuing	Not Applicable

5. (U) RELATED ACTIVITIES: Related activities are in 63728F, Advanced Computer Technology, 64740F, Computer Resourse Management Technology and the new DOD Software Initiative. The related activities are directed at development phase of a weapon system. This project is the only effort directed toward specific embedded computer system support needs and is applications oriented.

6. (U) WORK PERFORMED BY: Air Force Logistics Command will manage this program with support from the Air Logistics Centers and the Air Force Systems Command.

7. (U) Embedded Computer Systems Improvement Program: (Single project less than $10 million in FY 1984)

A. (U) Project Description: Project develops better support capabilities for embedded computer systems to avoid duplication, redundancy and improve operational support and productivity. To accomplish this critical operational support need, five elements of this project will commence in FY 1984. These elements include embedded computer systems readiness support, networks, extendable integrated support facilities, standardization/automation, and engineering practices.

Program Element: #71112F
DOD Mission Area: #473, Central Supply Activity

TITLE: Embedded Computer Systems Improvement Program
Budget Activity: 06, Defense Wide Mission Support

B. (U) Program Accomplishments and Future Efforts:

1. (U) FY 1982 Accomplishments: The program was defined during this time. The AFLC Statment of Operational Need was validated by HQ USAF.

2. (U) FY 1983 Program: Continued planning efforts further defined this program.

3. (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: The program will officially commence. Requirements definition and validation are planned with contractural assistance for embedded computer systems readiness support, networks, extendable integrated support facilities, standardization/automation, and engineering practices. This effort will continue into FY 1985.

4. (U) Program to Completion: Includes continuation of activities to include fabrication, integration and concept test'ng to provide increased operational readiness and support productivity for digital systems support on most of our modern weapon systems.

C. (U) Major Milestones: Not Applicable.

8. (U) PROJECTS OVER $10M IN FY 1984: Not Applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #78011F
DOD Mission Area: Production Base Support, #480

Title: Industrial Preparedness Program
Budget Activity: Defense-Wide Mission Support, #6

1. (U) RESOURCES (PROJECT LISTING)($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	1,977	4,806	5,154	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program maintains and provides required improvements for Air Force-owned, contractor-operated facilities; engineers, validates, and demonstrates new manufacturing technologies; funds technical portion of factory/plant Technology Modernizations (Tech Mod); and provides industrial base strategic and tactical planning. These efforts are necessary to reduce acquisition costs and lead times, improve industrial readiness, and provide surge capability. This funding will provide the absolutely critical technology base for future efforts and allow for the development of potentially ultra-high payoff manufacturing technologies. It will provide a direct link between the Air Force Manufacturing Technology (MANTECH) program and academia. It will help develop academic centers of manufacturing excellence which will stimulate the undergraduate and graduate education of manufacturing engineers. Effort will include research and development in intelligent task-automation, computer-aided engineering, design and manufacturing, and real time processing.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

RDT&E		0	1,977	4,867	Continuing	N/A
Procurement:	Aircraft	93,800	147,400	157,100	Continuing	N/A
	Missile	24,616	27,200	26,600	Continuing	N/A
	Other	9,835	10,548	11,188	Continuing	N/A

The FY 1984 changes reflect several facilities actions necessary for Air Force plants to properly support Air Force acquisition including the B-1B & AMRAAM and a reduction of Other Procurement to allow increased Aircraft Procurement MANTECH & Tech Mod emphasis.

4. (U) OTHER APPROPRIATION FUNDS ($ in thousands):

		FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Estimated Costs
Procurement:	Aircraft	103,200	145,800	169,500	116,900	Continuing	N/A
	Missile	27,655	27,000	33,495	34,054	Continuing	N/A
	Other	9,900	10,498	6,119	10,729	Continuing	N/A

Program Element: #78011F
DOD Mission Area: Production Base Support, #480

Title: Industrial Preparedness Program
Budget Activity: Defense-Wide Mission Support, #6

5. (U) RELATED ACTIVITIES: Both the Army and the Navy maintain active Industrial Preparedness programs. Other government agencies such as NASA and the National Bureau of Standards maintain active MANTECH efforts. The latter activity is fully coordinated through the DOD Manufacturing Technology Advisory Group (MTAG). Numerous joint MANTECH projects involving two or more services and other government agencies are coordinated through subcommittees of the MTAG. Internal Air Force participants are the Air Force Systems Command (AFSC) and the Air Force Logistics Command (AFLC). Projects are jointly planned and prioritized with appropriate major command doing the execution. Typical efforts providing technical input to this PE include 62102F, Materials; 62201F, Aerospace Flight Dynamics; 62203F, Aerospace Propulsion; 62302F, Rocket Propulsion; and 63211F, Aerospace Structures and Materials. This program impacts numerous other Air Force program elements, such as 64226F, B-1B and 72007F, Depot Maintenance. Existing subelements of this PE include Industrial Facilities, Industrial Base Planning, Industrial Productivity & Responsiveness Improvement, and Manufacturing Technology.

6. (U) WORK PERFORMED BY: The program is executed by the AFSC and AFLC for implementation in private industry. Agencies participating in the execution include the Wright Aeronautical Laboratories, AFSC's system product divisions, and AFLC's Air Logistics Centers. Many contractors are involved, including McDonnell-Douglas, Rockwell International, Lockheed, Avco, General Dynamics, Martin-Marietta, Boeing, Westinghouse, General Electric, Pratt & Whitney, and numerous additional prime and sub aerospace contractors. Well over 80 contracts are expected to be funded in FY 1984. Several academia/industry teams will perform the research and development efforts.

7. (U) PROJECTS LESS THAN $10 Million in FY 1984:

A. (U) Project: Industrial Preparedness Program, PE 78011F.

B. (U) Project Description: Erosion of the Aerospace Forces industrial base and the advancing technology of weapon systems, equipment, and aerospace materiel have caused greatly increasing acquisition and maintenance costs. This increase is further complicated by the increasing dependence on foreign sources for critical/strategic materials and materiel. Correction of this situation is needed. This includes: maintenance and improvement of existing industrial plants, new facilities, new technology (demonstrated as a major factor in productivity improvement), and capitalization needed for facilitation and modernization. Additional analyses, both for overall guidance and planning and for specific implementation will guide investment, improvement, and the development of a scientific foundation critical for technology improvement. The objective of this program element is to fund appropriate work where private industry cannot or will not make such investments. This program element stimulates private investment through government "seed" investment in technology and shares the risks and benefits of mutual investment. Major benefits of the program element include reduced acquisition costs or cost avoidances, reduced acquisition lead times, reduced maintenance costs and process time, and improved product quality. A benefit resulting from this is technology diffusion that will enhance our national industrial base as a whole, thus increasing our international economic competitiveness.

Program Element: #78011F
DOD Mission Area: Production Base Support, #480

Title: Industrial Preparedness Program
Budget Activity: Defense-Wide Mission Support, #6

C. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

(1) (U) FY 1982 Accomplishments: Numerous manufacturing technology efforts have been completed and transferred to the private sector. One example was the engineering and validation of improved composite fabrication techniques that will significantly reduce production costs and have demonstrated applicability to large aircraft structures. The Technology Modernization (Tech Mod) (a contractually linked government investment in technologies and private industry investment in capitalization) with the F-16 prime contractor has yielded a return to date which exceeds the goverment investment of $25M. Anticipated benefits to the Air Force investment are returns of nearly 9:1. This program completed critically required facilities maintenance and improvements, including environmental protection actions. Facilities projects were accomplished at Air Force plants: 3 (Tulsa, OK), 4 (Fort Worth, TX), 6 (Marietta, GA), 19 (San Diego, CA), 28 (Everett, MA), 42 (Palmdale, CA), 44 (Tucson, AZ), 59 (Binghamton, NY), 63 (Grafton, MA), 78 (Brigham City, UT), and others. Industrial Base Planning was initiated.

(2) (U) FY 1983 Program: Industrial Preparedness Planning will receive new emphasis as Industrial Base Planning. This emphasis includes planning an overall strategy and developing a guide for industrial preparedness/productivity/responsiveness actions. An RDT&E initiative will assess and start the development of manufacturing sciences in the areas of sensor device phenomena and sensor theory, control theory, 3-dimensional material flow technology for computer aided forging die design/manufacture, and end-effector phenomenon and manipulator theory. Advanced manufacturing research will be explored in areas such as submicron electronic device processing technology, composite fabrication theory, electronic and avionic packaging technology, metal removal phenomenon, and others. The technology portion of the B-1B Tech Mod for the airframe and propulsion prime and sub contractors will also start. Facilities projects will be accomplished at Air Force Plants: 3 (Tulsa, OK), 4 (Fort Worth, TX), 6 (Marietta, GA), 19 (San Diego, CA), 28 (Everett, MA), 29 (Lynn, MA), 42 (Palmdale, CA), 44 (Tucson, AZ), 59 (Binghamton, NY), 78 (Brigham City, UT), 85 (Columbus, OH) and others. Industrial Base Planning will also be performed.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: Manufacturing science will include research and development in intelligent task automation; computer aided engineering for forging die design and manufacturing; processing for improved fabrication yield of mercury-cadmium-tellerium infra-red detectors; intelligent/interactive curing of composites; closed loop processing of optical coatings; and computer planning, management, and control of electronic packaging. Planning products will become available to guide FY 86-90 program investments. Industrial Base Technology Modernizations will be pursued to incentivize private capital investments both in the AFSC contract sub-tiers and with at least one AFLC contractor, and the technology portion of the B-1B Tech Mod will be completed. Critical facilities supporting Air Force systems will be maintained and improved as required.

(4) (U) Program to Completion: Existing programs will continue. Major new MANTECH thrusts will be initiated based on planning guidance. Manufacturing Science results will be transitioned into procurement and O&M funded MANTECH efforts. New capital incentive efforts and industrial preparedness measures will be initiated based on planning guidance. These efforts will be incorporated within the appropriate acquisition programs. Individual planning efforts will be consolidated into an integrated system.

D. (U) Milestones: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #78019F
DOD Mission Area: #451 - Major Ranges and Test Facilities

Title: Utah Test and Training Range
Budget Activity: #6 - Defense Wide Mission Support

1. (U) RESOURCES (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	1,793	2,080	2,229	2,250	Continuing	Not Applicable

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Utah Test and Training Range (UTTR) is located in western Utah and consists of 5800 square miles of controlled airspace and 2875 square miles of restricted land area. The range supports test and evaluation of Air/Ground Launched Cruise Missiles (ALCM/GLCM), Remotely Piloted Vehicles (RPV), and parachute recovery systems; Tactical Air Command combat crew training; Air Force Logistics Command aircraft and munitions tests; Air Force Test and Evaluation Center (AFTEC) operational test and evaluation; and training for the Air Force Reserves. RDT&E funds are used to develop new instrumentation and to improve and modernize existing range instrumentation used for gathering and processing telemetry, optical, and metric data for range users.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
RDT&E	1,793	2,080	2,342		Continuing	Not Applicable
Other Procurement	2,781	987	1,656		Continuing	Not Applicable

4. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1982	FY 1983	FY 1984	FY 1985	Additional to Completion	Total Estimated Cost
Other Procurement (3080)	3,022	964	1,596	706	Continuing	Not Applicable

5. (U) RELATED ACTIVITIES: The Utah Test and Training Range supports DoD programs and those of other government agencies. The majority of the workload is performed under contract (60 percent). The funding source for this contract is the Operations and Maintenance appropriation.

6. (U) WORK PERFORMED BY: The Utah Test and Training Range is managed and operated by the Air Force Systems Command's 6501st Range Squadron at Hill AFB, UT. Procurement and contract management support is provided by the Air Force Systems Command's Air Force Flight Test Center at Edwards AFB, CA. The RDT&E appropriation will be used to fund six technical equipment improvement contracts in FY 1984, the largest of which is anticipated to be less than $600,000. The contracts will be released for bid in FY 1983.

7. (U) UTAH TEST AND TRAINING RANGE (SINGLE PROJECT LESS THAN $10 MILLION IN FY 84):

A. (U) Project Description: RDT&E funds are used to improve and modernize the range instrumentation used for gathering and processing telemetry, optical and metric data for range users. Range users include development and operational testing of cruise missiles, unmanned vehicles, and airborne parachute recovery systems. It also supports airborne tactical training for active and reserve units, and provides scenarios for large scale operational exercises.

Program Element: #78019
DOD Mission Area: #451 - Major Ranges and Test Facilities

Title: Utah Test and Training Range
Budget Activity: #6 - Defense Wide Mission Support

B. (U) Program Accomplishments and Future Efforts:

(1) (U) FY 1982 Accomplishments: Effective at the beginning of FY 1979 the Utah Test and Training Range was placed within the purview of Department of Defense Directive 3200.11, the directive which governs the use, management and operation of major DoD ranges and test facilities. FY 1982 RDT&E funds were used to continue the upgrade of the range mission control center and communications system.

(2) (U) FY 1983 Program: RDT&E funds will be used to continue the upgrade of the range communication system and the upgrading of data transmission and display systems.

(3) (U) FY 1984 Planned Program and Basis for FY 1984 RDT&E Request: RDT&E funds will be used to continue the range update into FY 1983. FY 1984 upgrades include continued upgrading of the range communications and data transmission and display systems. Additional efforts include the development of a small airborne instrumentation unit which will be compatible with existing ground instrumentation and additional upgrades to the mission control center.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Major Milestones: Not Applicable

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #78026F
DOD Mission Area: #473 - Defense System Cost Effectiveness/ Improvements

Title: Productivity, Reliability, Availability, and Maintainability (PRAM)
Budget Activity: #6 - Defense Wide Mission Support

1. (U) RESOURCE (PROJECT LISTING): ($ in thousands)

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	9,665	9,681	14,472	17,134	Continuing	N/A

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Air Force has an urgent need to reduce the rising cost of ownership and improve productivity, reliability, availability and maintainability of its operational systems. The office of the Secretary of Defense (OSD) FY 81-85 Consolidated Guidance stated, "We have learned that it is virtually impossible to anticipate and solve all reliability problems in a complex weapon system before it is fielded. In order to realize the intended performance from a system, one must plan to improve the design with reliability and maintainability modifications throughout most of its service life." PRAM has continued to respond forcefully to fill this major gap for programs since its inception in 1975 by the Air Force Chief of Staff, through judicious and timely investments in projects leading to lower life cycle costs and improved operational readiness. The need for continuing this vital program has been documented over the years by commanders of both Air Force Systems Command and Logistics Command, and has been underscored by the Assistant Secretary of Air Force for Research, Development and Logistics as well as the Under Secretary of Defense for Research and Engineering.

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY: ($ in thousands)

RDT&E	9,165	9,681	10,145	Cont.	N/A

Program funding level of effort increased in FY 84 and FY 85 to allow the Air Force to expand the scope of the PRAM program. The expanded program will save at least an additional $25 million from FY 84 projects and $40 million from FY 85 projects.

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

5. (U) RELATED ACTIVITIES: This program is related to Program Element (PE) 64212F, Aircraft Equipment Development (AED), which has as one of its goals the reduction of weapon systems ownership costs though development of aircraft equipment with minimum life cycle cost. The PRAM and AED programs are complementary with AED basically funding development of end items of equipment and PRAM primarily funding adaptation of: (1) high reliability, current technology to older systems, (2) adaptation of commercial items and procedures to military applications, and (3) improvements in development and acquisition techniques, methods and specifications.

PRAM plays a complementary role with the aircraft engine Component Improvement Program (CIP). The CIP is concerned with performance growth in specific current operational engines. PRAM's role deals with efforts applicable to several engines that improve reliability or lower engine life cycle costs. To ensure their complementary operation, PRAM propulsion projects are closely coordinated with the Air Force Propulsion Lab and the Aeronautical Systems Division's Propulsion Program Office. A dialogue has been established with the Army and Navy through which program activities and accomplishments are being exchanged.

6. (U) WORK PERFORMED BY: The PRAM Program Office is located at Wright-Patterson AFB, OH. Satellite PRAM offices have been established at each of the five Air Force Air Logistics Centers and at the Aerospace Guidance and Metrology Center in Newark, OH. The Air Force Flight Dynamics, Avionics, Materials and Propulsion Laboratories, as well as the Air Force Flight Test Center, Aeronautical Systems Division, and the Space Division, have been participants in PRAM projects.

The five largest PRAM contractors in FY 82 were: Boeing Military Aircraft Company, Wichita, KA; Hewlett-Packard, San Antonio, TX; Systems Research Lab, Dayton, OH; McDonnell Douglas, St. Louis, MO; General Electric, Burlington, VT; There were 78 additional contractors with a total of 104 separate contracts valued at $5.5M.

7. (U) PRODUCTIVITY, RELIABILITY, AVAILABILITY, AND MAINTAINABILITY (PRAM) (Single Project over $10 million in FY 84):

A. (U) Project Description: The Department of Defense (DOD) Consolidated Guidance for FY 81-85 highlights the fact the "our tactical Air Forces represent the most expensive investment among our general purpose forces. Procurement and operating costs continue to rise steadily, more rapidly than defense spending as a whole, even after adjusting for inflation." The guidance further expresses "deep concern about the future impact of these trends on the size, age, and readiness of the forces," and calls for "major initiatives to reverse these disturbing trends and to provide an effective combat capability commensurate with our increasing commitment of resources." The PRAM program is filling this urgent requirement to reduce the rising cost of ownership while improving the operational readiness of our in-service weapon systems. PRAM's judicious and timely investment in projects lead to lower life cycle costs. These improvement projects drive the very same parameters (e.g., productivity, reliability, availability and maintainability) that lead also to improved operational readiness.

(U) This program attacks the high cost of doing business by focusing management attention and funds in a concentrated effort to reduce operational and support costs without sacrificing systems effectiveness. The program objective is pursued through investments in cost reduction projects. These projects are to: (1) improve the reliability and maintainability of weapon systems through modifications and parts substitution, (2) improve the efficiency and productivity of maintenance and logisic support organizations at all levels through improved procedures and documentation, (3) exploit lower life cycle cost alternatives in systems configurations through component commonality and use of current technology lower cost components, (4) improve specifications, standards, test methods and techniques, and (5) enhance the operational readiness of our deployed systems. Implementation of these projects leads to: reduced support manpower requirements; lower spares consumption, stock levels and storage/transportation costs; improved force readiness; and, fuel conservation through improved equipment and techniques. The need for PRAM projects for operational systems stems from the fact that technology advances through several cycles during the single lifetime of many of our systems. Successful prototypes or studies are not implemented by PRAM, but are implemented by procedural changes, such as preferred spares, or through the Air Force Modification Program.

Program Element: #78026F
DoD Mission Area: #473 - Defense System Cost Effectiveness/ Improvements

Title: Productivity, Reliability, Availability, and Maintainability (PRAM)
Budget Activity: #6 - Defense Wide Mission Support

(U) To manage this program, an office has been established which is manned by personnel experienced in the research and development, acquisition, and logistic support disciplines. This is a joint Logistics Command and Systems Command office, equally responsible and responsive to the two commanders. As such, the program office is able to cut across traditional functional and organizational lines to accomplish its goals. This office operates an integrating leadership organization, achieving its objectives primarily through interaction with Air Force Laboratories, System Program Offices, Air Logistics Centers, Major Commands and industry.

(U) PRAM provides the front-end risk reduction, investigation, prototyping and evaluation of improvement projects geared toward in-service weapon systems. These projects lead to improved hardware, specification, standards, test methods, and adaptation of commercially available items to lower in-service weapon system/subsystem life cycle costs. PRAM funds will not be used to develop new systems or to augment the funding of other development programs. Completed projects are subjected to audit during the amortization period to verify savings.

B. (U) Program Accomplishments and Future Programs:

(1) (U) FY 1982 and Prior Accomplishments: The PRAM Program Office was formed in August 1975. As of September, 1982, PRAM had initiated 577 projects representing a cumulative PRAM investment of $68.2 million for an estimated program net savings, five years after implementation, of $1.78 billion. These projects were in the areas of airframes, avionics, propulsion, missiles and space, depot maintenance, and other support areas. A total of 385 projects have been completed with a combined five-year savings of $872.8 million for a PRAM investment of $37.9 million. An example of reducing operations and support costs is the Portable Servoactuator Test System prototyped by PRAM to test actuators on the aircraft. Many actuators are needlessly removed because there is no way to determine their condition without removal and shop inspection. The PRAM tester can determine the conditon of a servoactuator while it is on the aircraft, thus eliminating unnecessary removal. The $1.8 million savings for this effort will result from increased productivity. Another productivity effort will facilitate the removal of hybrid packages of electronic components from avionics printed circuit boards without damaging the circuit boards. This effort will save $3.2 million for the F-15 aircraft alone, and will be applicable Air Force wide. PRAM is increasing depot productivity by introducing new technology. An advanced tungsten inert gas welding system will allow repair of aircraft components currently condemned as non repairable. In addition, this system does not require heat treating of finished parts, since it operates at relatively low temperature. Annual savings at one depot alone will exceed $1.2 million.

(2) (U) FY 1983 Program: The $9.7 million program provided a stable program funding level. In the functional areas addressed by PRAM (i.e., airframes, avionics, missiles and space, propulsion, depot and other support), advances in technology accelerate through several generations during the operational life span of most of our older weapon systems. PRAM will continue to harness new technology and facilitate its transition to our in-service systems to lower the cost of ownership. In addition, PRAM will continue to place great emphasis on support of urgent Air Force initiatives within our Charter. In this regard, PRAM has undertaken projects to increase reliability, increase productivity, conserve fuel, and reduce operations and support costs. One project to increase reliability will macroencapsulate high voltage power supply components of aircraft avoinics. A one to five mil layer of modified polyurethane will form an insulating and moisture barrier which will dramatically reduce component failures. The component will be accepted under normal

Program Element: #78026F
DOD Mission Area: #473 - Defense System Cost Effectiveness/ Improvements

Title: Productivity, Reliability, Availability, and Maintainability (PRAM)
Budget Activity: #6 - Defense Wide Mission Support

production qualification testing procedures, with lower production costs and greater reliability. Estimated five year savings are $3.9 million. An effort to increase depot productivity will utilize new technology to reduce by 75% the manhours required to inspect plating, stripping and cleaning solutions. An Inductively Coupled Plasma system will replace current quantitative analysis techniques. The process has Air Force-wide application. Annual savings at San Antonio Air Logistics Center alone are expected to be $200 thousand. Another PRAM effort is testing an improved wing fuel tank sealant to reduce fuel leaks. The new sealant utilizes pyramid shaped fluorosilicone particles, instead of plastic beads. Testing to date indicates the new sealant out-performs the current sealant by a factor of twelve.

(3) (U) FY 1984 Program: The FY 1984 program funding level of $14.5 million, an increase of $4.8 million over FY 1983, reflects vitally needed real program growth. This growth reflects the increased participation of different Air Force agencies in the exploitation of cost reduction opportunities. Senior military and civilian Air Force executives continue to stress the need for this vital program. Accordingly, PRAM will apply maximum management attention to improve the operational readiness and to lower the cost of ownership of our older in-service systems. Candidate PRAM projects exceeding the budget request have been compiled. As in the past, projects actually pursued will be those offering the best potential return on investment. This program provides investment funds for projects leading to reduced cost of ownership or enhanced force readiness in the areas of airframes, avionics, propulsion (non-Component Improvement Program applications affecting logistics support, repair technology and test methods that impact more than one engine model), missiles, depot maintenance and other support areas. Specific projects to be funded will be formulated by the PRAM Program Office and its affiliated field offices. Selection of projects will be based on such criteria as risk, projected cost, return on investment, net savings, amortization period, implementation period, or the contribution to current Air Force initiatives (i.e., readiness, mobility, fuel conservation) within the scope of the PRAM Charter. Projects selected for investment will continue to be audited during the amortization period.

(4) (U) Program to Completion: This is a continuing program.

C. (U) Milestones: Not applicable.

FY 1984 RDT&E DESCRIPTIVE SUMMARY

Program Element: #01004F
DOD Mission Area: International Activities, #460

Title: International Military Headquarters and Agencies
Budget Activity: Defense-Wide Mission Support, #6

1. (U) RESOURCES (PROJECT LISTING)($ in thousands):

Project Number	Title	FY 1982 Actual	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimate Costs
	TOTAL FOR PROGRAM ELEMENT	2,670	2,788*	2,722	2,746	Continuing	Not Applicable
2447	SHAPE Technical Centre/ AGARD/Coop R&D		2,463	2,397	2,421		
2446	Von Karman Institute		325	325	325		

2. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program satisfies Department of Defense (DOD) administrative agent responsibilities for the North Atlantic Treaty Organization (NATO) Advisory Group for Aerospace Research and Development (AGARD) in Paris, France and for the Supreme Headquarters Allied Powers Europe (SHAPE) Technical Centre (STC) in The Hague, Netherlands, pays for United States scientists at STC, supports United States Air Force participation in cooperative research and development (R&D) agencies and groups, and pays the United States share of NATO support for the von Karman Institute in Brussels, Belgium. Support of this program is a continuing international commitment under the auspices of NATO and our mutual weapons development agreements with our allies.

*Excludes civilian pay raise effective 1 October 1982

3. (U) COMPARISON WITH FY 1983 DESCRIPTIVE SUMMARY:

	FY 1982	FY 1983 Estimate	FY 1984 Estimate	FY 1985 Estimate	Additional to Completion	Total Estimated Costs
RDT&E	2,595	2,788	2,762		Continuing	Not Applicable

4. (U) OTHER APPROPRIATION FUNDS: Not Applicable

Program Element: #01004F
DOD Mission Area: International Activities, #460

Title: International Military Headquarters and Agencies
Budget Activity: Defense-Wide Mission Support, #6

5. (U) RELATED ACTIVITIES: Supports international cooperative R&D agreements, Information Exchange Projects, the US Mutual Weapons Development Data Exchange Program, The Technical Cooperation Program with the United Kingdom, Canada, Australia, and New Zealand, the Defense Research Group, and the US Air Senior National Representative to the Under Secretary of Defense for Research and Engineering.

6. (U) WORK PERFORMED BY: Leading US civilian and military scientists, engineers, and administrators.

7. (U) PROJECTS LESS THAN $10 MILLION IN FY 1984:

A. Project: 2446 von Karman Institute. Funds US share of NATO support to the von Karman Institute for Fluid Dynamics in Brussels, Belgium. This international research facility is instrumental in advancing the state of the art in fluid dynamics and related disciplines. The von Karman Institute was founded in 1956 under NATO auspices as an international non-profit scientific organization. Principal objectives--provide post-grad programs in fluid dynamics, aeronautics, turbomachinery. Financial support comes from the supporting nations (57%), Belgian national support (13%) and research grants or industrial contracts (30%). US share of the 57% internationally-funded portion is 12.5%, for cooperative basic research with other NATO nations and a flow of internationally educated scientists who return this expertise to their own countries.

B. Project: 2447 SHAPE Technical Centre/AGARD/Coop R&D. The Supreme Headquarters Allied Powers Europe (SHAPE) Technical Centre (STC) is a multinational organization responsible directly to the Supreme Allied Commander, Europe. The Centre provides scientific and technical advice on military problems with emphasis on Command, Control and Communications. The United States Air Force (USAF), as administrative agent, supports 21 of 114 international scientist and engineer positions at STC. These salary expenses are reimbursed at North Atlantic Treaty Organization (NATO) rates thru credits to our NATO account. (Since the United States (US) pays less than NATO for an equivalent position, the US receives more credit than is actually spent.) The Advisory Group for Aerospace Research and Development (AGARD) provides technical advice and assistance to the NATO Military Committee, promotes advances and cooperation in the aerospace science and provides assistance to requesting NATO member nations to help increase their aerospace scientific and technical potential. The USAF is also administrative agent for AGARD and funds non-government as well as USAF participation in the AGARD scientific and technical meetings. This includes contracting for special services such as language translation for meetings in the US. In addition to AGARD-sponsored cooperative Research & Development (R&D) efforts, this program pays for USAF participation in data exchange and engineer exchange agreements with free world countries, and participation in those NATO agencies and groups in which USAF membership and participation is directed by treaty or other agreement. Two new Data Exchange Annexes (DEAs) with Australia on Aircraft and Stores compatibility testing and Ramjet Propulsion technology are under negotiation. Discussions with the French on addressing Variable Flow Directed Rocket Technology and E-3A AWACS continued. A memorandum of Agreement was completed with Germany on Millimeter Wave/Infrared Measurements and negotiations initiated for a MOU on Millimeter Wave Technology with the United Kingdom. A US/Israel program of testing on Electromagnetic Signal Intercept DF Ministrike Vehicle was initiated. STC initiated nine new projects and continued work on 20 other projects in Force Capability Studies and International level C^3 for the Allied Commander Europe. Continue funding the salaries of US Scientists/ Engineers and administrate personnel assigned to STC who work on Electronic Warfare and Command and Control Systems. Support participation of up to 100 US experts in AGARD technical panels and working groups. Support AGARD meetings in the US to include French/English interpretation. Support initiatives under the NATO Conference of National Armament Directors. Meet US treaty obligations through participation in NATO working groups and conferences. Efforts will continue towards reaching agreements on Family of Weapons concepts. The Scientist and Exchange Program with NATO and non-NATO nations will continue.

MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT-OWNED FACILITIES

FUNDED BY RDT&E

Department/Agency: Air Force

Date: January 1983

PART I. UTILIZATION OF SECTION 2353, TITLE 10 AUTHORITY

Specialized R&D facilities determined to be necessary for the performance of a contract for a Military Department for research and development, may be constructed by or furnished to the contractor and funded from appropriations available for research, development, test and evaluation. The Congress enacted this legislation, now 10 USC 2353, in 1956. This policy is executed through DOD Directive 4275.5. Under this policy, the Secretaries of the Military Departments or their designees, and the Directors of Defense Agencies may approve facilities projects up to $3,000,000; the Under Secretary of Defense Research and Engineering approves projects exceeding $3,000,000. The Congress is notified in advance of starting any project involving construction, regardless of the dollar amount. The table below provides a summary listing of all such projects accomplished in FY 82 and planned in FY 83 and FY 84.

Facility/Equipment	RDT&E Project Number	Contractor	Location	Total Obligational Authority (Thousands of Dollars) 1982	1983	1984	1985
			SECTION I Projects Accomplished or Underway				
ESD Building 1302C - Addn to Elec. Research Lab 2/	63431F	MIT - Lincoln Lab	Hanscom AFB MA		780.0		
			SECTION II Projects Planned or Projected				
CONUS. OTH-B Radar Facilities 2/	12417	General Electric	Bingham AFS ME Columbia Falls ACS ME Bangor IAP ME	500.0	20,500.0	4,000.0	
ESD Antenna Test Range, Addn 1/	Various	MIT - Lincoln Lab	Hanscom AFB MA		82.8		
TOTAL, PART I				500.0	21,362.8	4,000.0	

1/ Initial Listing
2/ Listed in FY 83 Submittal

411 951

MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT-OWNED FACILITIES

FUNDED BY RDT&E

PART II. UTILIZATION OF RDT&E APPROPRIATION FOR FACILITIES AT GOVERNMENT-OWNED/GOVERNMENT-OPERATED INSTALLATIONS

Chapter 251 (which was approved by the GAO as DOD Instruction 7220.5) provides that RDT&E appropriations may finance the development, design purchase and installation (including directly related foundations, shielding, environmental control, weather protection, structural adjustments, utilities and access) of equipment or instrumentation required for research, development, test and evaluation activities. The table below provides a summary listing of all such projects for the installation of equipment, where the cost of installation is $100,000 or more, accomplished in FY 82 and planned in FY 83 and FY 84.

Facility/Equipment	RDT&E Project Number	Location	1982	Total Obligational Authority (Thousands of Dollars) 1983	1984	1985
		SECTION I Projects Accomplished or Underway				
Particle Beam (RADLAC) 2/	62601F	Kirtland AFB, NM	300.0			
Temp Building/EMP Testing 2/*	64747F	Kirtland AFB, NM	200.0			
Temp Facility for Sandia Optical Range 2/	63605F	Kirtland AFB, NM	3355.0			
Modernize Component Research Air Facility 2/*	62203F	Wright Patterson AFB, OH	750.0	820.0	1925.0	1520.0
Modify Printed Circuit Fabrication Shop 1/	65807F	Wright Patterson AFB, OH	136.8			

912 952

MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT-OWNED FACILITIES

FUNDED BY RDT&E

Facility/Equipment	RDT&E Project Number	Location	Total Obligation Authority (Thousands of Dollars) 1982	1983	1984	1985
SECTION I Projects Accomplished or Underway						
Alter Integrated Maintenance Facility 2/*	64406F	Edwards AFB, CA	2800.0			
Alter ABRES Pad #3 for HPTEM 3/	63424F	Vandenberg AFB, CA	570.0			
Tunnel A/B/C Controls 2/*	65807F	Arnold AFS, TN		154.1		
Machinery Condition Monitoring 2/*	65807F	Arnold AFS, TN	339.7	154.5	62.7	271.3

MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT-OWNED FACILITIES

FUNDED BY RDT&E

Facility/Equipment	RDT&E Project Number	Location	Total Obligation Authority (Thousands of Dollars) 1982	1983	1984	1985
		SECTION I Projects Accomplished or Underway				
Install Vititation Heater Aeropropulsion Test Unit 2/*	65807F	Arnold AFS, TN	993.0			
Weapons Effect Test Facility 2/	64708F	Eglin AFB, FL	1800.0	2220.0		
		SECTION II Projects Planned or Projected				
Trailing Wire Antenna 1/	64747F	Kirtland AFB, NM		263.0	1706.0	3202.0
Install Fume Hood Exhaust System 1/	62204F	Wright Patterson AFB, OH		200.0		
Installation of Computer Systems Support 1/	63253F 62204F	Wright Patterson AFB, OH			585.0	
WIS Development & Evaluation Facility (DEF) 1/	33152F	Hanscom AFB, MA		75.0	75.0	60.0

MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT-OWNED FACILITIES

FUNDED BY RDT&E

Facility/Equipment	RDT&E Project Number	Location	1982	Total Obligation Authority (Thousands of Dollars) 1983	1984	1985
		SECTION II Projects Planned or Projected				
Install Power Distribution System 1/	62204F	Wright Patterson AFB, OH		75.0		
Install Communication Cable for LABSNET 1/ 4/	62201F	Wright Patterson AFB, OH	82.0	100.0	70.0	40.0
Consolidate Calib & Instrumentation Facilities 1/	62201F	Wright Patterson AFB, OH		233.0		
Modify Gasdynamics Facility 1/	62201F	Wright Patterson AFB, OH		310.0	489.0	
Replace Test Cell Augmentor 1/	62203F	Wright Patterson AFB, OH				200.0
Install 1000 HP Drive Stand 1/	62203F	Wright Patterson AFB, OH			150.0	
Install Combustion Air Heaters and Exhaust Sys 1/	62203F	Wright Patterson AFB, OH				250.0

MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT-OWNED FACILITIES

FUNDED BY RDT&E

Facility/Equipment	RDT&E Project Number	Location	Total Obligation Authority (Thousands of Dollars) 1982	1983	1984	1985
SECTION II Projects Planned or Projected						
Top Secret Data Processing Center 1/	65806F	Wright Patterson AFB, OH		1300.0		
Equipment Installation Reliability Characterization Lab 1/	62702F	Griffiss AFB, NY		95.6		
Advanced Visual Technology System (AVTS) Equipment Installation 1/	63227F	Williams AFB, AZ			500.0	
16S Instrumentation Improvement 1/	65807F	Arnold AFS, TN		355.7		
Test Preparation Lab VKF (PTF) 1/	65807F	Arnold AFS, TN			131.6	148.5
CAD/CAM (PTF) 1/	65807F	Arnold AFS, TN		200.0	200.0	
Flexible Nozzle for Tunnel 4T 1/	65807F	Arnold AFS, TN				509.3

MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT-OWNED FACILITIES

FUNDED BY RDT&E

Facility/Equipment	RDT&E Project Number	Location	Total Obligation Authority (Thousands of Dollars) 1982	1983	1984	1985
		SECTION II Projects Planned or Projected				
ETF-B Rocket Exhaust Modification 1/	65807F	Arnold AFS, TN			421.9	
Test Facility Plant Automation (PIF) 1/	65807F	Arnold AFS, TN				1,444.0
Particulate Removal System 1/	65807F	Arnold AFS, TN			350.0	
Radiographic System 1/	65807F	Arnold AFS, TN			315.0	
Equipment Installation Avionics Systems Testing 1/	64226F	Edwards AFB, CA			105.0	
Equipment Installation in Support of B-1B 1/	65807F	Edwards AFB, CA		277.0		
Solid Propellant Cut and Trim 1/	62302F	Edwards AFB, CA		220.0		
Temporary Liquid Hydrogen	62302F	Edwards AFB, CA		370.0		

MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT-OWNED FACILITIES

FUNDED BY RDT&E

Facility/Equipment	RDT&E Project Number	Location	1982	Total Obligation Authority (Thousands of Dollars) 1983	1984	1985
		SECTION II Projects Planned or Projected				
Install SPADOC-4 Equip. 2/	12311F	Colorado Springs CO		750.0		
Unattended Radar Stations Complete (North Warning Sge) 1/		3 Sites, To Be Determined				10,500.0
GWEN Relay Node 1/	33131F	To Be Determined			668.0	
Computer Operations and System Management Center (COSMIC) 1/	65898F	Andrews AFB MD		200.0		
Equipment Installation, Secure Communication 1/	65898F	Andrews AFB MD		200.0	585.0	

MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT-OWNED FACILITIES

FUNDED BY RDT&E

Facility/Equipment	RDT&E Project Number	Location	Total Obligation Authority (Thousands of Dollars) 1982	1983	1984	1985
		SECTION II Projects Planned or Projected				
Rapid Runway Recovery Facility 1/	64708F	Europe			3,600.0	
Cannister Assembly Launch Test Program 2/	64312F	Nevada Test Site NV			200.0	100.0
M X Basing Mode Testing 1/	64312F	Dept of Energy's Nevada Test Site & other CONUS Locations		38,600.0	85,500.0	40,400.0
Hard Target Weapon System	65807F	Eglin AFB FL			4,000.0	
TOTAL PART II			11,326.5	47,253.3	101,643.7	58,645.1

* Approved Change in Cost or Scope
1/ Initial Listing
2/ Listed in FY 83 Submittal
3/ Project previously submitted in FY 83 as Titan 395C Launch Facility for HPTEM
4/ This project is 90% complete of the original scoped program of $82K. Additional requirement necessitates reprogramming to $292K.

PART 3. UTILIZATION OF RDT&E APPROPRIATION FOR MINOR CONSTRUCTION

For in-house installations, construction projects in support of R&D for $100,000 or less are funded from RDT&E appropriations. Such expenditures are authorized by 10 USC 2674 and the applicable provisions of the current DOD Appropriacion Act. Under this procedure, project approval at this level is authorized by the Major Command concerned, or delegated to R&D installation commanders as appropriate. The table below provides a summary total of such minor construction accomplished in FY 82, and the estimated amounts planned for FY 83 and FY 84. All minor construction must result in a complete and usable facility. In no event are two or more minor construction projects or minor and major construction projects to be contrived to form a usable facility:

SUMMARY OF MINOR CONSTRUCTION FUNDED BY RDT&E, AIR FORCE

	FY 82	FY 83	FY 84	FY 85
TOTAL PART 3*	5,490.3	12,065.7	10,926.8	6,941.9
SUBTOTAL PART 1	500.0	21,362.8	4,000.0	
SUBTOTAL PART 2	11,326.5	47,253.3	101,643.7	58,645.1
SUBTOTAL PART 3	5,490.3	12,065.7	11,003.8	6,941.9
GRAND TOTAL	17,316.8	80,681.8	116,647.5	65,587.0

* Includes minor construction projects between $100,000 and $200,000.

1 COMPONENT		2 DATE
Air Force	FY 1983 RDT&E FACILITIES PROJECT DATA	January [illegible]

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
HANSCOM AFB, MASSACHUSETTS	ADDITION TO LINCOLN LABORATORY ANTENNA TEST RANGE

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST $000
VARIOUS	319-995	HA-83-0075	82.8

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST $000
Addition to Lincoln Laboratory Antenna Test Range				
Anechoic Chamber	SF	800		71.7
Structural				(26.6)
Architectural				(27.0)
Mechanical				(8.3)
Electrical				(9.8)
Subtotal				71.7
Contingency (10%)				7.2
Total Funded Cost				78.9
Supervision, Inspection, Overhead (5%)				3.9
				82.8
Design Cost (6%)				(5.0)
Cost of Purchased Equipment				(300.0)

10 DESCRIPTION OF PROPOSED INSTALLATION: Addition of an anechoic chamber to Lincoln Laboratory Antenna Test Range.

PROJECT: Construct a 40' x 20' x 17' addition behind the present Antenna Test Range building to be used as an anechoic chamber for antenna testing in a controlled environment.

REQUIREMENT: Increased workload necessitates a permanent anechoic chamber to accommodate the requirements of the FLTSATCOM Extremely High Frequency Package (FEP) program, MILSTAR related studies and general purpose test requirements for the entire Laboratory. The addition is sized so that a Scientific-Atlanta Compact Antenna Range can be installed to permit accurate measurement of millimeter-wave antennas up to four feet in diameter.

CURRENT SITUATION: The existing Antenna Test Range has one small general purpose anechoic chamber. There is no room for expansion to support additional testing imposed by new programs.

IMPACT IF NOT PROVIDED: Problems in scheduling use of the existing small chamber will affect the FEP and other Laboratory programs depending on priority. MILSTAR related studies may prove to be impossible to perform with sufficient accuracy using the existing equipment.

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1 COMPONENT	FY 1982 RDT&E FACILITIES PROJECT DATA	2 DATE
Air Force		January 1983

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO	MODIFY PRINTED CIRCUIT FABRICATION SHOP, FACILITY 20005

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
65807	211-152	WP 40-0 (R1) EQ 80-9013 (R2)	(529) 72.2 (592) 136.8

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Modify Printed Circuit Fabrication Shop, Facility 20005				
Funded Cost				
Minor Construction (529)	SF	1,150	61.65	72.2
Equipment Installation (592)	LS			136.8
Low Bid	LS			(124.4)
Contingency (10%)	LS			(12.4)
Unfunded Cost (Including Design)				19.6
Total Cost				228.6

10. DESCRIPTION OF PROPOSED INSTALLATION

SPECIFIC PURPOSE: To upgrade the Printed Circuit Fabrication Shop to allow "state-of-the-art" advances in fabrication of printed circuits involving procedures/techniques and processes all operating within a semi-clean room environment.

PROJECT: Modify the Printed Circuit Fabrication Shop installing a suspended ceiling, fluorescent safe lights, conditioned air to semi-clean room criteria, using deionized water, etc. Chemical solutions used necessitate fume control/venting an associated connection to all utilities. Installation of a deionized water system and make-up air system is also required for positive pressure and adequacy of air flow venting conditions.

REQUIREMENT: State-of-the-art advances in the fabrication of printed circuits require that procedures, processes, and techniques be conducted in a semi-clean room environment for maximum circuit quality. This is especially true for a one-of-a-kind article used in development testing application.

CURRENT SITUATION: The shop area is located in a common structure next to a "foundry" type operation. The shop has no suspended ceiling, no fume venting capability, and ineffective positive pressure air system. From an overall point of view, the shop is grossly inadequate in meeting semi-clean room criteria.

IMPACT IF NOT PROVIDED: Continued printed circuit fabrication of low quality because of inability to use new techniques in a semi-clean room environment. Questionable in-house R&D laboratory test results and various test problems due to quality of printed circuits fabricated in the current shop environment.

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962

1. COMPONENT		2. DATE
AIR FORCE	FY 1983 RDT&E FACILITIES PROJECT DATA	January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
KIRTLAND AFB, NEW MEXICO	TEMPORARY CONSTRUCTION, TRAILING WIRE ANTENNAS (TWA)

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
64747F	390-171	KLD 182-3	5,171

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
TEMPORARY CONSTRUCTION				
TRAILING WIRE ANTENNAS (TWA)				5,171
SITE PREPARATION				(400)
TEST PLATFORM				(1,600)
GROUND PLANE				(2,075)
MAINT. SUPPORT AREA				(200)
TRANSMISSION LINES/TRANSITION SECTION				(350)
UTILITIES				(300)
5% CONT.				(246)
DESIGN COST (NON-ADD)				(310)
R&D EQUIPMENT (NON-ADD)				(5,350)
MINOR CONST. (FENCING/ROADS) (NON-ADD)				(125)

10. DESCRIPTION OF PROPOSED R&D WORK: Leveling/grading a large test area, constructing a large test platform with an isolation system and installing the ground plan, transmission lines, and associate utilities.

PROJECT: Construct temporary Electromagnetic Pulse (EMP) test platform to evaluate Trailing Wire Antennas (TWA).

REQUIREMENT: Develop an EMP simulation capability to conduct required testing for evaluation of long conductors designed with the potential for operating in a hostile electromagnetic environment. This simulation must satisfy the requirement to evaluate the operational capabilities of TWA used with aircraft such as E-4B in the EMP criteria environment.

CURRENT SITUATION: AFWL is the lead laboratory for Air Force EMP testing. There are several EMP test facilities at Kirtland AFB, but none are adequate for testing TWA.

IMPACT IF NOT PROVIDED: Failure to approve this temporary construction will delay the DOD integrated EMP testing programs, and the Air Force could be forced to accept the E-4B and other AF systems using TWA, untested or inadequately tested. There are no qualified facilities to accommodate this required testing and technical research needs.

DD FORM 1 DEC 76 1391 PREVIOUS EDITIONS MAY BE USED INTERNALLY UNTIL EXHAUSTED PAGE NO

1. COMPONENT	FY 1983 RDT&E FACILITIES PROJECT DATA	2. DATE
Air Force		January 198[illegible]

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO	EQUIPMENT INSTALLATION INSTALL FUME HOODS

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
62204F	317-311	EQ 82-9100	200.0

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Equipment Installation				
Install Fume Hoods				200.0
Fume Hood Installation	EA	12	2.5	(35.0)
Exhaust Fans	EA	7	3.0	(23.0)
Ductwork	LS			(28.0)
Controls	LS			(20.0)
Air Conditioning System Expansion	LS			(52.0)
Secondary Utilities	LS			(39.0)
*Install Interior Partitions (Existing)	LS			(3.0)
Cost of Purchased Equipment (Non-Add)				
Fume Hood	LS			(60.0)
Total Equip and Installation Cost (Non-Add)				(260.0)
Other Non-Add Cost				
Design Cost (8%)				(21.0)

10. DESCRIPTION OF PROPOSED INSTALLATION: Install 12 chemical fume hoods, all associated ductwork, exhaust fans, controls, electrical utility work and air conditioning system expansion.

PROJECT: Install fume hoods to support electronics research involved in developing new avionics systems.

REQUIREMENT: The Electronics Research Branch of the Avionics Laboratory is engaged in basic research in semi-conductor materials (crystals) which are used to fabricate electronic devices such as transistors and integrated circuits that go into avionics systems. While conducting R&D experiments involving these materials, hazardous and toxic chemicals and gases are used. Adequate fume hoods are required to remove the fumes emitted from these chemicals and gases to provide a safe and proper environment while conducting R&D experiments.

CURRENT SITUATION: Adequate clean room conditions do not exist in the laboratory. Fume hoods are obsolete with flow rates well below the requirements to properly remove hazardous fumes emitted during R&D experiments and to maintain safe and effective operations. Conditions have become so critical that crystal growth research has come to a virtual standstill.

IMPACT IF NOT PROVIDED: Research will not proceed and the laboratory will be unable to fulfill its mission.

*Partitions are on laboratory CA/CRL records and have been identified to Congress as equipment.

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DD FORM 1 DEC 76 1391 — PREVIOUS EDITIONS MAY BE USED INTERNALLY UNTIL EXHAUSTED — PAGE NO

1. COMPONENT	FY 1984 RDT&E FACILITIES PROJECT DATA	2. DATE
Air Force		January 198[illegible]

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO	EQUIPMENT INSTALLATION COMPUTER SYSTEMS SUPPORT

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
63253, 62204	310-932	EQ 82-9145	585.0

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Equipment Installation Computer System Support	LS			585.0
Secondary Utilities	LS			(335.0)
Air Conditioning	LS			(150.0)
Electromagnetic Shielding	LS			(100.0)
Cost of Purchased Equipment (Non-Add)				(10,000.0)
Total Equipment & Installation Cost (Non-Add)				(10,585.0)
Other Non-Add Costs				
Design Cost				(60.0)
Minor Construction (Non-Add)				(150.0)

10. DESCRIPTION OF PROPOSED INSTALLATION: Install secondary utilities, expand the air conditioning system, and provide electromagnetic shielding.
SPECIFIC PURPOSE: Provide complete and usable support facilities to accommodate new computer equipment and integrate the various computer systems in the Avionics Laboratory, Bldg 620.
PROJECT: All work necessary to provide computer system support for the Avionics Laboratory, Bldg 620.
REQUIREMENT: Adequate facilities are required to support new computer equipment for the ADA Language Systems (ALS), PAVE PILLAR image and graphics generation and software support and to provide the capability to perform advanced simulation techniques in support of the avionics mission.
CURRENT SITUATION: Proposed computer area in the Avionics Laboratory does not have adequate cooling capability, secondary utilities or electromagnetic shielding to support the additional computer equipment. In addition, a number of physically separate but functionally interdependent computer systems now exist. Integration of these systems will provide a broadband computer communications network to support the entire Avionics Laboratory, Bldg 620.
IMPACT IF NOT PROVIDED: Without this project, the additional computer equipment cannot be installed. This would seriously impact the PAVE PILLAR project mission and the projects using the ADA Language System. The Avionics Laboratory also would not be able to keep pace with the advanced simulation techniques required in developing new navigation and electronic warfare systems.

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1. COMPONENT		2. DATE
Air Force	FY 1983 RDT&E FACILITIES PROJECT DATA	January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
HANSCOM AFB MASSACHUSETTS	EQUIPMENT INSTALLATION WIS DEVELOPMENT & EVALUATION FAC(DEF)

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
33152F	310-316	ES-83-013	275

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Equipment Installation WIS Development & Evaluation Facility	SF	40,000	6.90	275
1st Increment 1983-84 Alter ADPE and Administrative Areas	SF	20,000	7.50	(150)
2nd Increment 1985-86 Alter ADPE and Administrative Areas	SF	20,000	6.25	(125)
Acquisition Cost of R&D Equipment (Non-Add)				(14,370)
Total Equipment and Installation Costs (Non-Add)				(14,645)

10. DESCRIPTION OF PROPOSED INSTALLATION: Expand the electrical and air conditioning systems, perform structural alterations to provide equipment areas and provide Tempest protection, physical security system to include secured doors, cipher locks, motion detectors and isolation transfer systems to support Top Secret operations.

PROJECT: This project will provide for alteration of an existing building to support the WWMCCS Information System (WIS) Development and Evaluation.

REQUIREMENT: The WIS Development and Evaluation Facility is part of the upgrade of the existing Worldwide Military Command and Control System (WWMCCS). It will be used by the USAF and system contractor to develop and test hardware and software for the WIS program. A secure controlled environment is required to give the facility a Top Secret capability. A contract with the system contractor is expected in June 1983 requiring that a development and evaluation facility be available shortly thereafter.

CURRENT SITUATION: WIS is a new program and has no facilities for developing and evaluating equipment. Bldg 1302F Annex is an existing building that was built for computer operations and related software support. The second floor is presently used as a system management engineering facility but could be easily returned to ADPE use. This would support increment one requirements. The first floor contains base computer equipment that is scheduled to be phased out in May 85 and could then be used to support increment two requirements.

IMPACT IF NOT PROVIDED: The capability to develop, test and evaluate WIS products will not be available to the USAF and system contractor. The modernization of WWMCCS will be delayed. The current operational deficiencies such as slow response time and lack of capacity for system expansion will continue.

1 COMPONENT	FY 1983 RDT&E FACILITIES PROJECT DATA	2 DATE
Air Force		January 1983

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO	EQUIPMENT INSTALLATION INSTALL POWER DISTRIBUTION SYSTEM

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
62204F	310-932	EQ 83-9101	75.0

9 COST ESTIMATES

ITEM	U M	QUANTITY	UNIT COST	COST ($000)
Equipment Installation				
Install Power Distribution System	LS			75.0
Electrical Junction Box	EA	1	40,000	(40.0)
Electrical Service	LS			(35.0)
Cost of Purchased Equipment (Non-Add)				
Computer System (Harris H800-1B)				(1,000.0)
Total Equipment and Installation Cost (Non-Add)				(1,075.0)
Other Non-Add Costs				
Design Cost (8%)				(6.0)

10 DESCRIPTION OF PROPOSED INSTALLATION: Install a 408 volt AC power distribution system consisting of an electrical junction box and associated electrical service.

PROJECT: Install a power distribution system to support a new computer system (Harris H800-1B).

REQUIREMENT: Adequate electrical power is required to support installation of a Harris H800-1B computer system. The Harris computer system will directly support exploratory and advanced digital avionic subsystems and provide support to avionic system design, integration and test. Scheduled delivery of the equipment is early 1983.

CURRENT SITUATION: Existing computer space is available in the Avionics Laboratory to accommodate the computer system, however, adequate power is not available to totally operate the equipment. Existing power is not sufficient to prevent temporary over and under voltage conditions, and provide a means of controlled power up and power down in case of air handler failure and over temperature conditions.

IMPACT IF NOT PROVIDED: Without this project, system reliability would be impacted and would seriously jeopardize PAVE PILLAR and other mission projects. The Avionics Laboratory would not be able to keep pace with simulation techniques required in developing new navigation and electronic warfare systems.

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(96)

1 COMPONENT	FY 1983 RDT&E FACILITIES PROJECT DATA	2 DATE
Air Force		January 198[illegible]

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO	EQUIP INSTALLATION, INSTALL COMMUNICATION CABLING FOR LABSNET

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
62201	311-174	EQ 82-9115	292.0

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Equipment Installation, Install Communication Cabling for LABSNET				292.0
Trenching and Backfill	LS			(170.0)
Cable and Trays	LS			(122.0)
New Equipment Costs (Non-Add)				(3;663.0)
Total Equipment & Inst Cost (Non-Add)				(3,955.0)
Other Non-Add Costs				
Design Costs				(23.0)

10. DESCRIPTION OF PROPOSED INSTALLATION: Install a 300 twisted pair cable from Bldg 240 to Bldg 45, Area B and install cable connection to Bldgs 31, 65, 145, 146, 255, in Area B and Bldg 255 in Area C. Trench, backfill and provide conduit and cable trays as necessary.

PROJECT: Installation of Computer Communication Network for Flight Dynamics Laboratory Scientific Network (LABSNET).

REQUIREMENT: This cabling is required in order to provide a communication link between the computers to be housed in Bldg 24C and a number of computer terminals located in Bldgs 31, 45, 65, 145, 146 and 255 in Area B and Bldg 255 in Area C. The computers located in Bldg 24C are part of the Flight Dynamics Laboratory Scientific Network (LABSNET).

CURRENT SITUATION: The Flight Dynamics Laboratory S&E work force is scattered in many buildings. No facilities presently exist whereby computer information can be transmitted from Bldg 24C to the other facilities within the Flight Dynamics Laboratory.

IMPACT IF NOT PROVIDED: Unless this communication cabling is installed, the Flight Dynamics Laboratory's overall mission will experience increased degradation from an S&E viewpoint, and the engineering personnel in the buildings listed above will not have access to the Bldg 24C computer systems and any future capabilities.

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1. COMPONENT	FY 1983 RDT&E FACILITIES PROJECT DATA	2. DATE
Air Force		January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO	EQUIPMENT INSTALLATION CONSOLIDATE CALIB/INST FAC

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
62201	311-174	EQ 82-9142	233.0

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQUIPMENT INSTALLATION				
Consolidate Calibration & Instrumentation Fac				233.0
Air Conditioning for Equipment	LS			(165.0)
Secondary Utilities for Equipment	LS			(68.0)
NON-ADD COSTS				
Cost of Existing Equipment	LS			712.1
Cost to Relocate Existing Equipment	LS			80.0
Design Costs				26.4
MINOR CONSTRUCTION (82.0445)(NON-ADD)				95.0

10. DESCRIPTION OF PROPOSED INSTALLATION

Calibration and instrumentation equipment of AFWAL/FIM, including force balance calibration rigs and pressure calibration systems, will be relocated from Bldg 50A and installed in Bldg 24C and 25A.

SPECIFIC PURPOSE: To consolidate the Calibration and Instrumentation activities of AFWAL/FIM.

PROJECT: R&D equipment installation in buildings 24C and 25A.

REQUIREMENT: The optimal configuration to perform force, pressure, and thermal measurement diagnostics during wind tunnel tests on advanced technology fighters and advanced cruise vehicles is to have calibration and instrumentation activities in close proximity to the wind tunnel. This results in improved utilization of scientists and engineers, prevents duplication of activities, and optimizes the use of R&D equipment.

CURRENT SITUATION: Laboratory support equipment and personnel in buildings are remote from the primary test activities in Bldg 24C. Because of this, Wind Tunnel model set-up and calibration are performed in Bldg 50A, approximately 700 ft from Bldg 24C and 25A. Available equipment use is not optimized since users are away for periods of time. This inefficient mode of operation cannot be continued, especially in light of a declining work force.

IMPACT IF NOT PROVIDED: Activities will remain distantly separated, resulting in a continuing inefficient and more costly operation.

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1. COMPONENT		2. DATE
Air Force	FY 1983 RDT&E FACILITIES PROJECT DATA	January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO	EQUIPMENT INSTALLATION, MODIFY GASDYNAMICS FACILITY, BLDG 25C

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
62201	311-174	EQ 829146	$799.0

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Equipment Installation, Modify Gasdynamics Facility, Bldg 25C				799.0
Cost of Purchased Equipment (Non-Add)				(2,250.0)
Total Equip & Inst Cost (Non-Add)				(3,049.0)
Other (Non-Add)				
Cost of Existing Equip at WPAFB				(6,200.0)
Cost of NASA Langley Equip				(1,000.0)
Cost to Relocate Fan from NASA Langley				(285.0)
Studies				(51.0)
Design Costs				(112.0)
Minor Construction (Non-Add)				(95.0)

10. DESCRIPTION OF PROPOSED INSTALLATION: Modify the Gasdynamics Facility complex to expand flow field and visualization capabilities in Bldg 25C.

PROJECT: Relocate and install RDT&E equipment in the Flight Dynamics Gasdynamic Facility.

REQUIREMENT: Extensive experimental flow field data is required for the cost-effective development and validation of the new aerodynamic analysis methods that have been made possible by the advent of large scale digital computers. An experimental capability that effectively applies advanced laser optics instrumentation, guided by flow visualization, is the only cost-effective method of obtaining the extensive flow field measurements in separate regions of predominantly subsonic flows necessary to support these developments.

CURRENT SITUATION: Present experimental capabilities exhibit limitations which preclude visualization to guide data acquisition and interpretation; effective optical measurements; acquisition of comprehensive off-body data; resolution of required detail to support computational technology development and restrict required interactivity between computational and experimental researchers.

IMPACT IF NOT PROVIDED: Contributions of improved computational methods to practical Air Force design problems will be both restricted and delayed. Both the Air Force and industry will continue to spend limited resources producing configuration dependent data which frequently duplicates that of others. This results in very fragmented growth of computational aerodynamic methods at relatively large national expense. Data sets of inadequate quality and quantity with very limited distribution and three to five times greater cost will continue to be the foundation of this rapid growth technology area.

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1. COMPONENT	FY 1984 RDT&E FACILITIES PROJECT DATA	2. DATE
Air Force		January 198[illegible]

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO	EQUIPMENT INST REPLACE TEST CELL AUGMENTOR, D BAY, BLDG 71A

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
62203F	318-612	EQ 81-9139	200.0

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Equipment Installation Replace Test Cell Augmentor, D Bay, Bldg 71A				200.0
RDT&E Equipment (Non-Add)				(50.0)
Total Equip & Installation Costs (Non-Add)				(250.0)
Engineering Analysis & Design (Non-Add)				(25.0)
Minor Construction (Non-Add)				(90.0)

10. DESCRIPTION OF PROPOSED INSTALLATION: All work necessary to provide noise attenuation. Work includes installation of sound absorbing material, and assembly and installation of the engine exhaust augmentor.

SPECIFIC PURPOSE: To provide noise attenuation in sea level engine test facility, D Bay, Bldg 71A.

PROJECT: Modify existing test cell and install engine exhaust augmentor. Install sound absorbing material on the test cell and install the augmentor in the test cell.

REQUIREMENT: To modify existing capability so that experimental engines and engines in the Air Force inventory can be tested at full power without damage to the engine or facility.

CURRENT SITUATION: Test cell is fatiguing due to noise generated by the aircraft engine undergoing test, thereby reducing the maximum capability of the test cell.

IMPACT IF NOT PROVIDED: R&D analysis and evaluation of full scale modern jet engines will be greatly limited due to the deteriorating test cell condition.

1 COMPONENT	FY 1984 RDT&E FACILITIES PROJECT DATA	2 DATE
Air Force		January 1983

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO	EQUIPMENT INSTALLATION INSTALL 1000 HP DRIVE STAND

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
62203F	318-612	EQ 82-9154	150.0

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Equipment Installation				
Install 1000 HP Drive Stand				150.0
Electrical	LS			(50.0)
Cooling	LS			(80.0)
Bed Plate	LS			(20.0)
Cost of Purchased Equipment (Non-Add)				(250.0)
Total Equipment & Installation (Non-Add)				(400.0)
Design Cost (Non-Add)				(32.0)
Minor Construction (Non-Add)				(75.0)

10. DESCRIPTION OF PROPOSED INSTALLATION: All work necessary to provide a test facility with the capability of 1000 horsepower (HP) to test advanced and developmental aircraft generators, auxiliary power units and hydraulic systems. Work includes a bed plate to hold the 1000 HP motor and test article, an acoustical enclosure around the bed plate, and all required secondary utilities.

SPECIFIC PURPOSE: Construct test area for high power drive equipment.

PROJECT: Install enclosure to house the 1000 HP drive system, provide lighting, cooling water, and secondary utilities.

REQUIREMENT: To provide capability to conduct basic and advanced research on aircraft power systems, such as, generators auxiliary power units and hydraulic systems. The Drive Stand is needed for the Directed Energy Weapon Program and Advanced Aircraft Generator Programs. It will be used for the testing of equipment on all current and future aircraft.

CURRENT SITUATION: The existing Aero Propulsion Laboratory Drive Stand facility has the capability to drive 300 HP loads. Many current and advanced aircraft power systems require higher drive systems.

IMPACT IF NOT PROVIDED: R&D analysis of aircraft power systems in support of directed energy weapons system development will be greatly limited.

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1 COMPONENT	FY 1985 RDT&E FACILITIES PROJECT DATA	2 DATE
Air Force		January 198[illegible]

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO	EQUIP INSTALLATION INSTALL COMBUSTION AIR HEATERS AND EXHAUST SYSTEM, BLDG 490

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
62203F	316-632	EQ 82-9155	250.0

9 COST ESTIMATES

ITEM	U M	QUANTITY	UNIT COST	COST ($000)
Equipment Installation				
Install Combustion Air Heaters and Exhaust System	LS			250.0
Utilities	LS			(200.0)
Base & Pads	LS			(50.0)
Equipment Cost (Non-Add)				(125.0)
Total Equipment & Installation Cost				(375.0)
Design Cost (Non-Add)				(20.0)

10 DESCRIPTION OF PROPOSED INSTALLATION: All work necessary to install two combustion air heaters and associated exhaust system to operate the Combustion Research Test Cell in Bldg 490.

PROJECT: Install two air heaters, exhaust systems, interconnecting piping, valves, and associated control systems.

REQUIREMENT: This project is for the laboratory mission of combustion research for aircraft engines. It expands the existing testing capabilities for combustion research which is unique within the United States Air Force. This will provide an adequate heat source to simulate altitude conditions on jet engines tied to an existing compressed air system, components undergoing basic and advanced research analysis. Provide adequate exhaust capability to reduce noise levels and other environmental considerations.

CURRENT SITUATIONS: Bldg 490 has recently been acquired as the result of an MCP. This work will finalize the installation of the combustion research test rig.

IMPACT IF NOT PROVIDED: The Bldg 490 Combustion Research Cells will not be able to operate to their designed potential. Critical engine combustion development programs will be severely limited.

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1 COMPONENT	FY 1983 RDT&E FACILITIES PROJECT DATA	2 DATE
Air Force		January 1983

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO	EQUIPMENT INSTALLATION TOP SECRET DATA PROCESSING CENTER

5. PROGRAM ELEMENT	6. CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
65806	311-173	EQ 82-9140	1380.0

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Equipment Installation Top Secret Data Processing Center				1380.0
Electromagnetic Shielding	LS			(483.0)
Raised Flooring	LS			(276.0)
Secondary Utilities	LS			(124.2)
Equipment Air Conditioning	LS			(414.0)
Halon Fire Protection	LS			(69.0)
Demountable Partitions	LS			(13.8)
Cost of Purchased Equipment (Non-Add)	LS			(2170.0)
Total Equip & Installation Cost (Non-Add)				(3550.0)
Other Non-Add Costs				
Design Cost				(115.0)

10. DESCRIPTION OF PROPOSED INSTALLATION

PROJECT: Installation of a computer facility to process Top Secret data for all ASD System Program Offices. Within the Class A vault area originally designed in the MCP, provide raised computer flooring, electromagnetic shielding, secondary utilities, Halon fire protection and demountable partitions to provide a complete and usable Top Secret data processing facility.

REQUIREMENT: The requirement for a Top Secret data processing facility was the direct result of recent changes in classification levels as outlined in the "Security Classification Guide for Low Observables," 9 Dec 81, HQ USAF/RFQ-LO). ASD develops detailed analytical models for each major weapon system. These models are coupled with aircraft low observables data and processed on digital computers to predict system effectiveness, survivability and vulnerability. The results are used to define system effectiveness design parameters and specifications, verify and validate contract proposals, make inputs to source selection teams, etc.

CURRENT SITUATION: Currently no ASD data processing facility exists that can provide the Top Secret data processing and storage capability required to perform the mission outlined above. A government owned and operated facility must be acquired.

IMPACT IF NOT PROVIDED: ASD will be unable to perform 90% of the projected system effectiveness studies without a local Top Secret data processing facility.

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DD FORM 1 DEC 76 1391 PREVIOUS EDITIONS MAY BE USED INTERNALLY UNTIL EXHAUSTED

1. COMPONENT	FY 1983 RDT&E FACILITIES PROJECT DATA	2. DATE
Air Force		January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
GRIFFISS AFB/RADC	EQUIPMENT INSTALLATION RELIABILITY CHARACTERIZATION LAB

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
62702	317-311	GRI-83-0015(R-1)	95.6

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQUIPMENT INSTALLATION	LS			91.0
SUBTOTAL				91.0
CONTINGENCY 5%				4.6
TOTAL CONTRACT COST				95.6
UNFUNDED COSTS (NON ADD)				(17.0)
EXCLUDED COSTS (NON ADD)				(4250.0)
MINOR CONSTRUCTION (NON ADD)				(90.0)

10. DESCRIPTION OF PROPOSED INSTALLATION: Convert 3200 SF of warehouse space to laboratory space. Equipment installation support involves providing for environmental control, raised flooring and secondary utilities.

PROJECT: Provides a combined facility for a R&D development program for solid state microwave and very large scale integrated circuit equipments.

REQUIREMENT: The physical requirement is for a facility where an in house capability can be developed for characterization and reliability evaluation of solid state microwave devices and complex high performance integrated circuits used in the most critical and expensive portions of Air Force Systems. A long term Research and Development (R&D) requirement has been levied upon the Reliability Characterization Lab in connection with the 2028 Advance Space Communications program to develop the reliability assessment for solid state microwave devices. The Air Force has the only capability for accomplishing this work and existing space is inadequate to accommodate the requirement.

CURRENT SITUATION: RADC is the electronic equipment reliability focal point for the Air Force. Currently, the Center has no in house capability to evaluate the failure mode and mechanisms of the next generation or solid state microwave and very large scale integrated circuits prior to use in critical Air Force Hardware.

IMPACT IF NOT PROVIDED: The Center will not be able to complete fulfill the mission to provide a timely assessment of new technologies or a reliable evaluation of modes of failure for controlled risk/benefit analysis of critical Air Force Hardware.

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1. COMPONENT	FY 1983 RDT&E FACILITIES PROJECT DATA	2. DATE
Air Force		January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
AFHRL/OT WILLIAMS AFB, AZ	ADVANCED VISUAL TECHNOLOGY SYSTEM (AVTS) EQUIPMENT INSTALLATION

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
63227F	310-925	2363-K-FM	500.0

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
A and E				55.0
Electrical - Secondary Utilities				85.0
Air Conditioning				90.0
Computer Floors				30.0
Enclose Computer Area				135.0
Security and Fire Protection				30.0
Relocate Existing Secondary Utilities				75.0
TOTAL				500.0
Project 2363 (AVTS) Equipment Cost				10,000.0

10. DESCRIPTION OF PROPOSED INSTALLATION: Modify the first floor of Room 102 in Bldg 558 to install the Advanced Visual Technology System (AVTS).

SPECIFIC PURPOSE: To install the AVTS hardware in an efficient manner with relationship to itself and with other visual system hardware in Bldg 558.

PROJECT: The AVTS consists of the following three major subsystems: Data Base Subsystem (DBS), General Purpose Computer Subsystem (GPCS), and Special Purpose Computer Subsystem (SPCS). This project installs the (AVTS) hardware which will generate dynamic visual tactical combat scenes on the existing cockpit displays in Bldg 558. The installation work consists of special floors and ceiling, secondary utilities, environmental controls and security items, etc.

REQUIREMENT: To provide the advanced simulator technology as the basis for obtaining research data required to provide training device criteria for the acquisition of new training equipment capable of training full mission air combat scenaries.

CURRENT SITUATION: Delivery of equipment is programmed during FY 84. Preliminary installation work must start in early FY 84 and be completed by mid FY 84 in order to start equipment checkouts to be followed by important behavior laboratory research involving tactical combat missions.

IMPACT IF NOT PROVIDED: The Air Force Human Resources Laboratory's Operations Training Division would not be able to integrate this new AVTS equipment with their existing capabilities, thus their laboratory research necessary to generate required standards for new Air Force mission simulators would be restricted.

1. COMPONENT		2. DATE
Air Force	FY 1983 RDT&E FACILITIES PROJECT DATA	January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
ARNOLD AIR FORCE STATION, TENNESSEE	EQUIPMENT INSTALLATION IMPROVE 16S TEST INSTRUMENTATION

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
65807F	390-127	815019	355.7

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQUIPMENT INSTALLATION				
IMPROVE 16S TEST INSTRUMENTATION	LS			355.7
COST OF PURCHASED EQUIPMENT (NON-ADD)	LS			(459.0)
TOTAL EQUIP & INSTALLATION COST (NON-ADD)	LS			(814.7)
DESIGN COSTS	LS			(20.0)

10. DESCRIPTION OF PROPOSED INSTALLATION: Installation of new equipment and the fabrication and installation of improved instrumentation to increase available air-on time and decrease maintenance costs.

SPECIFIC PURPOSE: Improve the 16-Foot Supersonic Wind Tunnel instrumentation systems in order to provide instrumentation support for compressor shakedown, tunnel calibration, and future testing.

PROJECT: This is a two-year project to improve the 16-Foot Supersonic Wind Tunnel instrumentation systems. It includes a minicomputer based digital pressure system, digital multiplexer and control systems with associated consoles. A centralized data production center will be installed to provide more efficient coordination and control of the test environment, along with improved computer peripheral devices, additional instrumentation and an improved model positioning system.

REQUIREMENT: It is imperative that wind tunnel data acquisition systems possess a high level of automation to improve their accuracy, reliability, and speed of operation due to increasing costs of energy and manpower.

CURRENT SITUATION: Existing 16S data acquisition systems are not computer-based and there is no centralized area for operating and monitoring test progress. Some instrumentation and computer peripheral equipment is nonexistent and would have to be borrowed from other facilities.

IMPACT IF NOT PROVIDED: Planned productivity improvements could not be implemented, and estimated annual savings of 86 occupancy shift hours and 500 maintenance manhours could not be realized. User test instrumentation requirements for planned near future programs could not be met.

1. COMPONENT	FY 1984 RDT&E FACILITIES PROJECT DATA	2. DATE
AIR FORCE		January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
ARNOLD AIR FORCE STATION, TENNESSEE	EQUIPMENT INSTALLATION TEST PREPARATION LAB - VKF

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
65807F	390-Various	840265	280.1

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQUIPMENT INSTALLATION				
TEST PREPARATION LAB - VKF (PIF)				280.1
COST OF PURCHASED EQUIPMENT (NON-ADD)	LS			(747.6)
TOTAL EQUIP & INSTALLATION COST (NON-ADD)	LS			(1027.7)

10. DESCRIPTION OF PROPOSED INSTALLATION

Install a central processing unit interfaced with data acquisition equipment and associated electrical and mechanical systems are to be installed in an existing facility in order to create a pre-test checkout lab for VKF.

REQUIREMENT: No present laboratory exists to meet the need for pretest checkout of test articles and support hardware prior to installation in the tunnel test section.

CURRENT SITUATION: When a test is being conducted in one wind tunnel, preparations are also in progress for subsequent tests in the model preparation area. This area does not have the equipment nor the instrumentation to provide a thorough pre-test check out of the test article and its support hardware. This deficiency results in considerable time being consumed for check out during and after installation in the wind tunnel.

IMPACT IF NOT PROVIDED: Failure to provide this system would result in the continued loss of available testing time due to downtime resulting from the inability to detect and correct potential problems prior to the installation of the test article. Delays impact the schedule to the extent of not meeting scheduled completion dates for high-priority projects for the Government or industry. Extended schedules result in additional labor costs and excessive energy utilization.

1. COMPONENT		2. DATE
AIR FORCE	FY 1983 RDT&E FACILITIES PROJECT DATA	January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
ARNOLD AIR FORCE STATION, TENNESSEE	EQUIPMENT INSTALLATION CAD/CAM (PIF)

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
65807F	390-Various	815012	$400

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQUIPMENT INSTALLATION COMPUTER AIDED DESIGN/COMPUTER AIDED MANUFACTURING (CAD/CAM)	LS			400
COST OF PURCHASED EQUIPMENT (NON-ADD)	LS			(3,197.0)
TOTAL EQUIP & INSTALLATION COST (NON-ADD)	LS			(3,597.0)

10. DESCRIPTION OF PROPOSED INSTALLATION Provide installation support for central computer(s) (interconnected for downloading and data-base sharing capabilities), thirty-two graphic work stations, hard copy units, digitizers, and plotters required to provide AEDC a CAD/CAM system for design/design drafting and other related activities.

PROJECT: Installation of a CAD/CAM system that will meet the current and future needs of AEDC.

REQUIREMENTS: In order to meet the productivity challenge and reduce lead times for vital aerospace items, AEDC has a need to implement new advances in system integration through the introduction of sophisticated CAD/CAM equipment. The new system will not only improve the productivity of the drafting personnel by 2.7:1 (reference CAD/CAM Audit by Productivity International, Inc, 3 Jul 81) but will allow much needed Finite Element Modeling, Numerical Control Programming, System Networking and Data-Base Management capabilities.

CURRENT SITUATION: At present, almost all of the design/design drafting work accomplished at AEDC is done on a drawing board. The present CAD/CAM system (an intergraph system with a DEC 11/34 central processing unit located in the Pan Am World Services, Inc, electrical design section) has shown the need for a base-wide CAD/CAM system. The present system can only support two work stations, and has been fully expanded. The new system will be available to all design/drafting sections at AEDC.

IMPACT IF NOT PROVIDED: If the new system is not purchased, AEDC will continue to accomplish design and design drafting activities on conventional drawing boards. Designers and design draftpersons are extremely difficult to hire because of their unique talents and the scarcity of people with this expertise. The new system will eliminate this problem

U.S. Government Printing Office: 1980—318-071/4132

1. COMPONENT	FY 1983 RDT&E FACILITIES PROJECT DATA	2. DATE
AIR FORCE		January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE (PIF)
ARNOLD AIR FORCE STATION, TENNESSEE	EQUIPMENT AND INSTALLATION FLEXIBLE NOZZLE FOR TUNNEL 4T

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
65807F	390-614	805020	509.3

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQUIPMENT INSTALLATION				
FLEXIBLE NOZZLE FOR TUNNEL 4T	LS			509.3
COST OF PURCHASED EQUIPMENT (NON-ADD)	LS			(2571.0)
TOTAL EQUIP & INSTALLATION COST (NON-ADD)	LS			(3260.3)
OTHER NON-ADD COSTS	LS			(730.9)
DESIGN COSTS	LS			(730.9)

10. DESCRIPTION OF PROPOSED INSTALLATION

Install a flexible nozzle system in Tunnel 4T to allow continuous Mach Number variations from 0.2 to 2.0. This will include installation of a new nozzle, new control system, and an extension of the existing Tunnel 4T instrument room.

REQUIREMENT: The capabilities of Tunnel 4T must be upgraded to match the capabilities of present and future fighter aircraft since this tunnel is the primary Air Force facility used to certify proper separation of weapon stores from combat aircraft.

CURRENT SITUATION: Tunnel 4T now has the capability of continuous Mach number variations for 0.2 to 1.3 and at 1.6 and 2.0 using nozzle inserts. Steps must be taken to fill the gap that exist in the Mach coverage from 1.3 to 2.0.

IMPACT: With the 1.6 and 2.0 nozzle inserts, serious gaps in the Mach coverage from 1.3 to 2.0 exists such that certification of aircraft/store compatibility for some supersonic aircraft is not possible. In addition, ten year savings of $15,294,600 in manpower in energy could not be recognized.

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☆U.S. Government Printing Office: 1980—310-071/4132

1. COMPONENT AIR FORCE	FY 1983 RDT&E FACILITIES PROJECT DATA	2. DATE January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
ARNOLD AIR FORCE STATION, TENNESSEE	EQUIPMENT INSTALLATION ETF-B ROCKET EXHAUST MOD

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
65807F	390-614	840242	421.9

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQUIPMENT INSTALLATION				
ETF-B ROCKET EXHAUST MODIFICATIONS	LS			421.9
COST OF PURCHASED EQUIPMENT (NON-ADD)	LS			(338.2)
TOTAL EQUIPMENT & INSTALLATION COST (NON-ADD)	LS			(760.1)

10. DESCRIPTION OF PROPOSED INSTALLATION

This project provides for installation support incident to adding ducting and three new surge valves and relocating three existing configuration valves on each side (E1 & E2) of the ETF-B exhaust plant to provide a recirculation surge control system for rocket firings.

REQUIREMENT: The installation of additional ducting and surge control; water valves on the B-Plant exhaust system is required to provide reliable exhauster surge protection during rocket testing. Secondary benefits are: (1) a vast savings of the gaseous nitrogen presently used for surge protection and (2) lower starting pressure level capabilities in the T Cells.

CURRENT SITUATION: For rocket tests, exhauster surge protection is provided by using a calculated rate of nitrogen inbleed to supplement the rocket flow and known air in leakage. Thus, this is an anticipatory, not positive, surge protection system and requires large quantities of gaseous nitrogen.

IMPACT: If the modification is not accomplished, one or more expensive exhaust compressors could be severely damaged by surging during rocket firings, and nitrogen savings will not be realized.

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1. COMPONENT	FY 19 84 RDT&E FACILITIES PROJECT DATA	2. DATE
Air Force		January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
ARNOLD AIR FORCE STATION, TENNESSEE	EQUIPMENT INSTALLATION TEST FACILITY PLANT AUTOMATION (PIF)

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
65807F	610-711	815005	$1,444

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQUIPMENT INSTALLATION				
TEST FACILITY PLANT AUTOMATION	LS			$1,444.0
COST OF PURCHASED EQUIPMENT (NON-ADD)	LS			3,208.0
TOTAL EQUIPMENT & INSTALLATION COST (NON-ADD)	LS			$4,652.0
OTHER NON-ADD COSTS	LS			3,357.0

10. DESCRIPTION OF PROPOSED INSTALLATION: This project supports installation of computer networks consisting of 20 mini/microcomputers with approximately 5,000 control channels to automate the control and monitoring of the large rotating machinery in the three major test facilities at AEDC and includes modifications to centralize control rooms within each of the three plants to: integrate the entire test operations; provide test environment, process, and configuration control, and allow evaluation of plant performance.

REQUIREMENT: Hardware and software systems must be provided to protect valuable and oftentimes unique aerospace systems being tested. Testing operations must be integrated to achieve specific test objectives with fewer test unit operating hours.

CURRENT SITUATION: Operation of the test facility plants is essentially manual with varying degrees of safety, performance, and efficiency due to differences in operator proficiency. Instrumentation systems are archaic and inadequate for monitoring critical plant parameters and machinery operating conditions. Integrated interfaces between plant control and test vehicle control do not exist.

IMPACT IF NOT PROVIDED: Reliability of the facilities will be severely compromised. Continued manual operation will preclude the benefits of an integrated facility control and monitoring system. The total time impact will be to decrease productive test time (as a result of more time spent on maintenance and operator dependence) and increased risk to plant equipment and test articles (as a result of obsolete equipment use and lack of critical parameter monitoring). Also precluded will be total savings of $7,355,700 per year (FY 84 dollars).

1. COMPONENT AIR FORCE	FY 1983 RDT&E FACILITIES PROJECT DATA	2. DATE January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
ARNOLD AIR FORCE STATION, TENNESSEE	EQUIPMENT INSTALLATION PARTICULATE REMOVAL SYSTEM

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
65807F	390-614	830354	350.0

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQUIPMENT INSTALLATION				
PARTICULATE REMOVAL SYSTEM	LS			350.0
COST OF PURCHASED EQUIPMENT (NON-ADD)	LS			100.0
TOTAL EQUIP & INSTALLATION COST (NON-ADD)	LS			450.0

10. DESCRIPTION OF PROPOSED INSTALLATION: Project provides installation support for particulate removal devices to be installed in the Engine Test Facility air supply ducting to improve air quality. The screens to be installed will be located in the main headers and in the cell supply ducting.

REQUIREMENT: High performance turbine engines require clean air to assure optimum performance and damage-free operation. The ETF air supply system, which has carbon steel, aluminum, and painted components is subject to corrosion and deterioration. Consequently, iron oxide, aluminum, and paint particles are present in the engine test air stream. At present, no specific removal device is in service.

CURRENT SITUATION: A particle removal system should be installed in the ETF test air supply system to improve air quality and reduce the possibility of engine damage of performance degration.

IMPACT: Engine test performance and components may be adversely affected by excessive particle contamination in the air stream.

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1 COMPONENT	FY 1984 RDT&E FACILITIES PROJECT DATA	2 DATE
AIR FORCE		January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
ARNOLD AIR FORCE STATION, TENNESSEE	EQUIPMENT INSTALLATION RADIOGRAPHIC SYSTEM

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
65807F	349	830439	$315.

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
RADIOGRAPHIC SYSTEM (INCLUDES CONTINGENCY)	EA	1		$840
EQUIPMENT				
X-RAY CAMERA	EA	1		$100
IMAGE DATA PROCESSOR	EA	1		150
OPERATOR CONSOLE	EA	1		100
UNIQUE SOFTWARE	EA	1		175
TOTAL				$525
FACILITY PREPARATION AND INSTALLATION	EA	1		$315
TOTAL REQUESTED				$840

10. DESCRIPTION OF PROPOSED INSTALLATION: Provide a radiographic sys consisting of an x-ray camera, an image data processor, the required software programs unique to AEDC and an operators console.

PROJECT: Installation of a Radiographic System that will meet the current and future needs of AEDC.

REQUIREMENT: In order to meet the requirement for non-destructive testing, detailed analyses and safety, AEDC has a need for a state-of-the art Radiographic System. The system will provide real-time radiographic inspection of large rocket motors, casting, running turbine engines, voids and in consistencies in case liners and powder packing anlaysis of rocket engines.

CURRENT SITUATION: At present, the capability of performing radiographic inspection does not exist at AEDC.

IMPACT IF NOT PROVIDED: If a system of this nature is not purchased, AEDC will not have the capability of computer-aided inspections of rocket motors, casting, turbine blades, and other structural analysis. This system will allow the evaluation of images, highlight potential defects in structure and powder packing in rocket motors, and will alert the operator to evaluate questionable images.

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1. COMPONENT AIR FORCE	FY 19 84 RDT&E FACILITIES PROJECT DATA	2. DATE January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
EDWARDS AIR FORCE BASE, CALIFORNIA	EQUIPMENT INSTALLATION AVIONICS SYSTEM TESTING

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
65807F	310-932	84-0505 EQ 80-22	105.0

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQUIPMENT INSTALLATION AVIONICS SYSTEM TESTING	LS			105.0
INSTALLATION				(100.0)
CONTINGENCY (5%)				(5.0)
COST OF PURCHASED EQUIPMENT (NON-ADD)				(6000.0)
TOTAL EQUIPMENT & INSTALLATION (NON-ADD)				(6105.0)
OTHER NON-ADD COSTS				(10.5)
DESIGN COST (10% PROJECT COST)				

10. DESCRIPTION OF PROPOSED Installation

Project provides for the installation of specialized secondary utilities to include hydraulics, cooling oil and high pressure cooling air to service avionics equipment installed in the bays.

11. PROJECT: Provides for the preparation of test bays to permit Avionics System Testing. Avionics Equipment to be installed in the test bays include mini-computer, test stations, test benches, test kits and program unique avionics equipment.

REQUIREMENT: A properly sized and configured facility is needed to support programs that require more complete Avionics Systems Testing (versus subsystem testing) for real life simulation of flight. Real life simulation is necessary for complete test accuracy that can otherwise be only achieved through expensive flight testing. The F-16 program will be the users of this facility.

CURRENT SITUATION: No facility exists in the USAF that can satisfy real life simulation of flight. Avionics Systems Testing programs are in existence, but on a subsystem test basis. IFAST is a facility already built that eliminates these limitations and gives a program/user range of testing capability not found elsewhere.

IMPACT IF NOT PROVIDED: Without the required installation work, real life simulation cannot be accomplished thus leaving us to continue subsystem testing. As a result, our Avionics Systems development will be severely curtailed, thus slowing down development of our F-16 program.

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1. COMPONENT	FY 1983 RDT&E FACILITIES PROJECT DATA	2. DATE
Air Force		January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
EDWARDS AIR FORCE BASE, CALIFORNIA	EQUIPMENT INSTALLATION IN SUPPORT OF B-1B

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
64226F	310-932	82-0531 EQ 80-22	277

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Equipment Installation	LS			263.8
Subtotal				263.8
Contingency 5%				13.2
Total Contract Cost				277.0
Non-Add Cost (In-house Design 10%)				27.0
Cost of Purchased Equipment (Non-Add)				(4,664.5)
Other Non-Add Costs				
Existing to be Relocated, Government Owned Property				16,365.7
Minor Construction (Non-Add)				43.6

10. DESCRIPTION OF PROPOSED INSTALLATION: Project requires installation of mechanical and electrical devices for Integrated B-1B Avionics Systems Development in the Integration Facility for Avionics Systems Testing (IFAST), and repair and check-out of integrated avionics systems components in the Integrated Test Facility (ITF).

SPECIFIC PURPOSE: Unit equipment changes to provide adequate facilities to support the B-1B Avionics Systems Testing and Development Program.

PROJECT: Provides for preparation of two IFAST bays to accommodate B-1B Avionics Subsystems for integration and overall system testing.

REQUIREMENT: Properly sized and configured facilities are required by 15 May 83 to house expanded B-1B Avionics Systems Development and Testing. The IFAST, with modifications to the ITF, will satisfy the Integrated B-1B Avionics Systems Test Requirements.

CURRENT SITUATION: The ITF is primarily an avionics maintenance facility and therefore does not have the capability to house the additional B-1B Avionics Systems Development and Testing. The facility has inadequate space for the required avionics testing equipment. The IFAST is a general purpose facility capable of supporting most test programs after appropriate program peculiar equipment installation. In Apr 82 the B-1B was identified as the first test program requiring the use of IFAST.

IMPACT IF NOT PROVIDED: Failure to receive out-of-cycle processing and subsequent approval will incur a minimum delay of 1 year for the B-1B Program, and will cause significant, cost escalation.

986

1. COMPONENT		2. DATE
Air Force	FY 1983 RDT&E FACILITIES PROJECT DATA	January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
KERN COUNTY EDWARDS AIR FORCE BASE, CALIFORNIA	EQUIPMENT INSTALLATION

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
62302F	310-632	830601	220

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Equipment Installation				
Solid Propellant Cut & Trim	LS			220
Equipment Foundations	LS			(20)
Reinforced Concrete Blast Shield	LS			(100)
Secondary Utilities	LS			(100)
Cost of Purchased Equipment (Non-Add)				(20)
Total Equip & Installation Cost (Non-Add)				(20)
Other Non-Add Costs				
Existing Equipment				(400)
Design Cost				(13)

10. DESCRIPTION OF PROPOSED INSTALLATION: Install a solid propellant cutting saw, lathe, vertical mill and dust/particle collector, a fire detection/protection system, and lighting. Install a reinforced concrete blast shield with viewing port between the remote operator and the equipment. Connect equipment to the required secondary utilities.

SPECIFIC PURPOSE: Unit Equipment Change. Locate solid propellant cut/trim laboratory in the area of the propellant pilot plant.

PROJECT: The equipment installation provides the verification process for solid propellant mixes in the process line.

REQUIREMENT: Solid propellant laboratory size samples provide the means to verify propellant mix processes, curing, aging and prediction programs. Approximately 2000 tensile and 200 chemical samples are prepared annually from aging propellants generated by AFRPL and contract development. As propellant formulations change based on aging studies, the physical and chemical properties are re-run. Process efficiency will be greatly improved by reducing travel time to another remote site and eliminate a major safety hazard of transporting hazardous propellant through other areas considered public thoroughfares.

CURRENT SITUATION: Cutting and trimming of experimental, solid rocket propellant is accomplished at a site which is two miles from the propellant pilot plant and mechanical properties laboratory. The same personnel operate all three sites. The cutting and trimming operation requires removing personnel from other operations and sending them to "re-open" the laboratory for one day, even when a full day's work is not necessary.

IMPACT IF NOT PROVIDED: Continues inefficient operations. Considerable extra work is required to open and secure a remote area. The transportation of propellant samples through other occupied areas creates a potential hazard.

1. COMPONENT	FY 1983 RDT&E FACILITIES PROJECT DATA	2. DATE
Air Force		January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
EDWARDS AIR FORCE BASE, CA KERN COUNTY	TEMPORARY LIQUID HYDROGEN SYSTEM

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
62302F	310-632	830602	370

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Temporary				
Liquid Hydrogen Supply System	LS			370
Reinforced Concrete Cell	SF	1,800	150	(270)
System Installation	LS			(100)
Design Cost (Non-Add)				(25)
Equipment (Non-Add)				
Liquid Hydrogen Tank				(300)
Transfer System				(150)

10. DESCRIPTION OF PROPOSED INSTALLATION: Construct a temporary reinforced concrete pad (2400 SF) bounded on three sides with reinforced concrete walls twenty feet high to accommodate the installation of a liquid hydrogen vessel and transfer system.

SPECIFIC PURPOSE: To provide liquid hydrogen for the Small Cryogenic Boundary Layer Loss Investigation program.

PROJECT: The temporary construction provides the capability to conduct experiments in an existing facility with liquid hydrogen as the fuel component.

REQUIREMENT: A program for advanced spacecraft using cryogenics will culminate in an advanced development effort in the 1985 - 1989 time period. Cryogenics offers higher performance rockets without the long-term storability of storable propellant.

CURRENT SITUATION: The Satellite Propulsion Complex has insufficient capability for supplying liquid hydrogen fuel for experiments on cryogenic deployment engine technology. To satisfy site approval requirements without sacrificing safety and to minimize liquid hydrogen transfer losses to the experiment vacuum chamber, the temporary liquid hydrogen facility must be located adjacent to the existing operational vacuum chamber.

IMPACT IF NOT PROVIDED: Mobile (temporary) fuel supply would be required; however, the operation would require a waiver and be extremely hazardous.

1. COMPONENT	FY 19 84 RDT&E FACILITIES PROJECT DATA	2. DATE
Air Force		January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
UNKNOWN	PROTOTYPE GROUNDWAVE EMERGENCY NETWORK (GWEN)

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
33131F	131-118	ES-84-001	668

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PROTOTYPE GWEN FACILITY	LS			668
Electric	LS			(50)
Site Improvement	LS			(519)
Shelter Concrete Pad	SY	33	21	(1)
Road, Hard Pavement	MI	1		(88)
Fencing	LS			(10)
REAL ESTATE ACQUISITION (NON-ADD)	AC	25	3600	90
DESIGN COST (6%) (NON-ADD)				40
R&D EQUIPMENT ACQUISITION (NON-ADD)				

10. DESCRIPTION OF PROPOSED INSTALLATION: Includes site preparation, electrical distribution, R&D equipment shelter pad, roadway and security fencing for prototype facility for the GWEN system.

PROJECT: Provides for a Groundwave Emergency Network (GWEN) relay node to serve as prototype for 44 relay nodes which will be used to relay information and Commands under emergency conditions.

REQUIREMENT: Provide a back-up communication system designed to relay information and commands under emergency conditions between NORAD and SAC bases as well as between aircraft and ground command posts. Peripheral tie-in of other national security facilities is also included. The purpose of the system is to provide many nodes which will assure survivability in the event of national emergencies when other communication systems have failed. These nodes will tie into receive and receive/transmit consoles at numerous locations throughout the Continental U.S.

CURRENT SITUATION: No back-up communication system exists to satisfy the requirement. The relay node is key to maintaining system integrity. The relay node to satisfy GWEN is new. There are no like facilities in existence. Based on results of tests presently being conducted in Phase I, (the first being the prototype) 45 relay nodes will be constructed as an initial thin line system. This in turn will be expanded to a final system of 300 nodes throughout the United States.

IMPACT IF NOT PROVIDED: Without the GWEN system, our national security and counter strike capability in the event of attack would be seriously compromised if not totally eliminated.

1. COMPONENT		2. DATE
Air Force	FY 1983 RDT&E FACILITIES PROJECT DATA	January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
ANDREWS AIR FORCE BASE, MARYLAND	EQUIPMENT INSTALLATION COMPUTER OPERATIONS AND SYSTEMS MANAGEMENT ENGINEERING CTR

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
65898	610-284		$200.0

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Equipment Installation, Computer Operations and System Management Engineering Center (COSMEC)	LS			200.0
Minor Construction (Non-Add)				200.0
Design Services (Non-Add)				24.0
Existing/Equipment (Non-Add)				10,000.0
New Equipment (Non-Add)				250.0

10. DESCRIPTION OF PROPOSED INSTALLATION: Installation of computer equipment in existing building area to include necessary fire protection, raised flooring, shielding, secondary utilities and air conditioning to support the installation.

SPECIFIC PURPOSE: Alter the existing theater into two floors providing equipment space and engineering support space.

PROJECT: Provide an adequate and secure area for ADP to serve the research and development mission of HQ AFSC.

REQUIREMENT: The AFSC mission requires the continuous processing of RDT&E information, some of which is individually classified, but in the whole contains unclassified information which when pieced together could inadvertently provide sensitive information to unauthorized individuals.

CURRENT SITUATION: The ADP is currently accomplished in various locations within the HQ AFSC building. These locations are completely inadequate having been converted office area. The raised flooring required has decreased the head room to less than 7' 2" in some areas. The areas are not shielded. The rooms are cramped for space and operation cannot function efficiently.

IMPACT IF NOT PROVIDED: As more of the business of management of R&D activities becomes automated, there is an increased need to protect the total information. More space is required to successfully deal with all the automation needs. If this project is not provided the current situation will continue to deteriorate and the possibility of compromise increases.

1. COMPONENT		2. DATE
Air Force	FY 1983 RDT&E FACILITIES PROJECT DATA	January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
ANDREWS AIR FORCE BASE, MARYLAND	EQUIPMENT INSTALLATION SECURE COMMUNICATIONS, HQ AFSC

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
65898	610-284		785.0

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQUIPMENT INSTALLATION, SECURE COMMUNICATIONS, HQ AFSC	LS			785.0
Minor Construction (NON-ADD)				10.0
Design Services (NON-ADD)				47.0
Excess Equipment on Hand (NON-ADD)				37.0
New Equipment (NON-ADD)				755.0

10. DESCRIPTION OF PROPOSED INSTALLATION: Provide support for the installation of secure communication terminal equipment in 9 locations at Headquarters AFSC.

SPECIFIC PURPOSE: The minor construction project will provide physical security to the air conditioning system serving the central classified computer in the AFSC Building.

PROJECT: The project will provide HQ AFSC staff offices with an essential capability for responsive data processing using classified and sensitive data resources.

REQUIREMENT: The ability to effectively and securely accommodate, manipulate and query classified and sensitive data is required to support timely and critical management decisions affecting AFSC's mission. Timely access to classified and other sensitive data is required to meet critical deadlines and to enhance the effectiveness of valuable resources.

CURRENT SITUATION: At present the staff must all use a single dedicated system that can only be used within the Computer Center Vault area. Much time is wasted in scheduling use of the system, handcarrying documents and data to/from the center, rekeying of data from subcommand submissions and setting up the system for secure operations thereby adversely impacting on the quality, timeliness, completeness of AFSC planning and mission accomplishment.

IMPACT IF NOT PROVIDED: Timely and critical management decisions will continue to be grossly restricted by out-moded and time-wasting computer hardware, unsecure communication and the lack of secure remote work station areas.

1. COMPONENT	FY 1984 RDT&E FACILITIES PROJECT DATA	2. DATE
Air Force		January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
EUROPE VARIOUS LOCATION	PROTOTYPE FACILITY RAPID RUNWAY RECOVERY

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
64708F	111-111		3,600.0

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Rapid Runway Recovery Prototype Facility				3,600.0
Site Improvement	LS			(750.0)
PCC Pavement	CY	7,000	100.00	(700.0)
AC Pavement	CY	5,200	155.75	(810.0)
Base/Subbase	CY	30,000	14.00	(420.0)
Storm Drainage	LF	17,200	7.50	(130.0)
Markings	LF	34,400	.29	(10.0)
Lighting, Edge	LF	17,200	4.65	(80.0)
Lighting, Approach	LS			(700.0)
Design Cost (NON-ADD)				(250.0)
Mobile Aircraft Arrestment System (NON-ADD)				(500.0)

10. DESCRIPTION OF PROPOSED INSTALLATION: Facility project includes runway approach and edge lighting, markings, storm drainage, and a mobile aircraft arrestment system to include all utilities and other necessary support.

PROJECT: Provide a facility to validate Rapid Runway Recovery capability developments.

REQUIREMENT: The urgent need for Rapid Runway Recovery (RRR) capability is established in Tactical Air Force (TAF) Statement of Operational Need (SON) 319-79, Post Attack and Recovery. Development Test and Evaluation (DT&E) is required to validate developments in RRR capability before USAF adoption and construction of follow-on facilities. Concrete pavement is a typical runway design, and will be used to validate bomb damage repair (BDR) materials and procedures. Remainder of pavement will be a validation of alternate launch and recovery surface (ALRS) construction, which is designed to accommodate only the initial aircraft sorties following an attack. A European site is essential to provide the necessary realistic test environment which will yield accurate measures of an air base's ability to generate sorties following an attack.

CURRENT SITUATION: There is no operational capability to rapidly recover and launch aircraft following an enemy attack on our runways. The RRR R&D Program has developed concepts which should provide this capability.

IMPACT IF NOT PROVIDED: The Air Force Engineering and Services Center (AFESC) will be unable to fully validate concepts to meet TAF SON 319-79. Therefore, a $600 million production/construction program would be implemented without complete validation in the field.

1. COMPONENT	FY 1983 RDT&E FACILITIES PROJECT DATA	2. DATE
Air Force		January [illegible]

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
VARIOUS LOCATIONS	M-X BASING MODE TESTING

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
64312	300-XXX		164,500

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
M-X Basing Mode Testing				164,500
Deep Basing (DB)	LS			(44,000)
Closely Spaced Basing (CSB)	LS			(120,500)
Unfunded Costs: (Non-Add)				250,620
Planning and Design				(9,870)
Concept Studies				(240,750)
Excluded Costs - Equipment Acquisition (Non-Add)				166,215

10. DESCRIPTION OF PROPOSED INSTALLATION: Provide for feasibility demonstration, equipment/concept development and recording/documenting test results for the Deep Basing (DB) and Closely Spaced Basing (CSB) M-X Systems.

PROJECT: DB - Provide test facilities including two ICBM System Egress Test Complexes complete with 300 LF access tunnels, shop and storage facilities, electrical distribution, access roads and water storage; construct 4000 LF of egress tunnels. CSB - Provide facilities including full size M-X vertical test capsules, a subsize test capsule, a Shock Isolation System canister test facility, two subsize Launch Control Facilities, a test pad, test roads and a building modification at the CSB test Development Test Site.

REQUIREMENT: Support the continued full scale development of the M-X missile system and investigation of basing modes.

CURRENT SITUATION: DB - Post-attack missile egress from a deep based system is the key technical issue impacting overall feasibility of the DB system. CSB - A requirement exists for validating the nuclear survivability of the M-X vertical capsule and launch control complex. There are no existing facilities that could be used to perform these tests.

IMPACT IF NOT PROVIDED: The test facilities provided here are necessary to continue the development of a survivable M-X basing mode.

1. COMPONENT	FY 19 84 RDT&E FACILITIES PROJECT DATA	2. DATE
Air Force		January 1983

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
EGLIN AIR FORCE BASE, FLORIDA	TEST FACILITY HARD TARGET WEAPON SYSTEM

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
PDP WSXX-1 65807	141-182	EGL 84-0	4,000.0

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Test Facility Hard Target Weapon System	LS			4,000.0
Design Cost (Non-Add)				(200.0)

10. DESCRIPTION OF PROPOSED INSTALLATION: Reinforced concrete underground bunkers and bunker segments. Exact size and locations have not been determined.

PROJECT: Provides for a test facility consisting of at least one underground two-story bunker.

REQUIREMENT: AFSC will start testing a weapon system in 1985 designed to counter underground hardened facilities. A number of realistic targets will be required to validate this weapon concept. These underground bunkers should be built to Soviet/Warsaw Pact specifications and will be destroyed during the testing process. Estimate a maximum of two full-up C^3 bunkers 100' x 100' x 2 stories, and 8 to 10 representative bunker segments.

CURRENT SITUATION: No test facilities representative of this target currently exist.

IMPACT IF NOT PROVIDED: The Armament Division will not be able to complete the required test program.