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DEPARTMENT OF THE AIR FORCE

DTIC

SUPPORTING DATA FOR FISCAL YEAR 1992/1993 BUDGET ESTIMATES

SUBMITTED TO CONGRESS FEBRUARY 1991



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DESCRIPTIVE SUMMARIES

RESEARCH, DEVELOPMENT, TEST AND EVALUATION

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SAF/AQXR
Rm. 4C347
Pentagon
Washington, DC 20330
Ms. Diane Arnold

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DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF
THE DEPARTMENT OF THE AIR FORCE RESEARCH AND DEVELOPMENT PROGRAM
FY 1992/1993
FEBRUARY 1991

INTRODUCTION AND EXPLANATION OF CONTENTS

1. (U) General. This document has been prepared to provide information on the USAF Research, Development, Test and Evaluation (RDT&E) Program to congressional committees during the FY 1992/1993 hearings. The Descriptive Summaries provide narrative information on all RDT&E Program Elements and projects.

(U) Pages 845 -854 are presented in response to the Senate Appropriations Committee requirement contained on page 78 of the Senate Appropriations Committee report (98-292, 1 November 1983).

(U) The section of the FY 1992/1993 Descriptive Summaries entitled "Facilities Exhibits" (pages 866-897) contains information on major improvements to, and construction of, government ovwned facilties funded by RDT&E.

2. (U) Comparison of FY 1990 and 1991 Data. A direct comparison of FY 1990 and FY 1991 data in the Program Element Descriptive Summaries dated January 1991, will reveal significant differences. Many of the differences are attributable to the following factors:

a. (U) FY 1991 reductions as a result of Congressional action on the appropriation.

b. (U) FY 1990 funding changes subsequent to October 1, 1991, including RDT&E Reprogramming Actions and a Supplemental Appropriation.

c. (U) Reclassification of FY 1990 and FY 1991 data to achieve comparability with the program structure for FY 1992/1993.

3. (U) Relationship of FY 1992/1993 Budget Structure to the FY 1991 Budget Approved by Congress.

PROGRAM ELEMENT		REMARKS
BUDGET ACTIVITY 3: STRATEGIC PROGRAMS		
0101113F	B-52 Squadrons	New program element
0302015F	NEACP/E-4B Class V Mods	New program proposed for FY92
0303601F	MILSTAR Satellite Communication System (AF Terminals)	Appropriated in OSD PE for FY91. AF funding resumes in FY92

PROGRAM ELEMENT		REMARKS
0303603F	MILSTAR Satellite Communication System	Same as program element 0303601F
0604226F	B-1B	No funding is planned for FY91
0604410F	Space Based Radar	New program element

BUDGET ACTIVITY 4: TACTICAL PROGRAMS

0207131F	A-10 Squadrons	FY91 funding deferred by Congress
0207136F	Manned Destructive Suppression of Enemy Air Defenses (MSEAD)	FY90 funds to be used in FY91
0207161F	Tactical Air Intercept Missile (AIM)	In FY91, funded through OSD program element 0603715D
0207162F	Tactical AGM Missile	Research, Development, Test & Evaluation (RDT&E) completed in FY91
0207316F	Tacit Rainbow	Program terminated
0207419F	Tactical Airborne Command & Control System	New project proposed for FY92
0207431F	Tactical Air Intell Sys	Program completed in FY91
0603109F	INEWS/ICNIA	Program completed in FY91
0603230F	Advanced Tactical Fighter	In FY92 and beyond, effort funded in program element 0604239F
0603714F	DOD Physical Security Equipment	New project which would normally be funded in OSD PE 0603228D
0604223F	Alternate Fighter Engine (AFE)	Program completed in FY91
0604242F	Advanced Tactical Aircraft (ATA)	Program closeout in FY91 IAW SECDEF decision to terminate A-12 contract
0604247F	Modular Automatic Test Equipment (MATE)	Program terminated.
0604250F	Integrated EW/CNI Dev	Program completed in FY91

PROGRAM ELEMENT		REMARKS
0604327F	Hardened Target Munitions	FY90 funds to be used in FY91
0604607F	Wide Area Antiarmor Munitions	Research, Development, Test & Evaluation (RDT&E) completed in FY91

BUDGET ACTIVITY 6: DEFENSE WIDE MISSION SUPPORT

0305138F	Upper Stage Space Vehicles	New program element for effort previously included in program element 0305171F
0305144F	Titan IV Space Booster	New Program element for effort previously included in program element 00305171F
0305171F	Space Launch Support	Upper Stages transferred to program element 0305138F in FY92 and beyond
0708012F	Logistic Support Activities	Funding in FY91 is in program element 0701112F

4. (U) Classification.

a. (U) Classified information is identified by use of brackets as [ ].

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0305144F	Titan Space Launch Vehicle	215	209
0207215F	TR-1 Squadrons	139	90
0604227F	Training Systems Development	192	575
0305138F	Upper Stage Space Vehicles	214	207
0303152F	USAF World-Wide Military Command and Control Sys	75	167
0604237F	Variable Stability In-Flight Simulator Test AC	98	594
0101313F	War Planning Automated Data Processing (ADP)-SAC	61	14
0603707F	Weather Systems - Advanced Development	38	527
0604707F	Weather Systems - Engineering Development	196	727
0604607F	Wide Area Anti-Armor Munition	112	702

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0101113F Budget Activity: #3 - Strategic Programs
PE Title: B-52 Squadrons

A. (U) RESOURCES ($ in Thousands)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
001	B-52 Universal Bombay Adapter					
	0	0	3,981	14,451	36,922	55,354
Total	0	0	3,981	14,451	36,922	55,354

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Modifies 47 B-52H aircraft for the rapid and nondestructive upload and download of the Common Strategic Rotary Launcher (CSRL) for conventional taskings. Frequent upload/download of the CSRL damages aircraft internal fuel tanks and CSRL/aircraft mounting brackets. This modification cuts the upload/download time by a factor of nine, eliminates damage to the aircraft, and allows for rapid reconfiguration for nuclear taskings.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) No funds were expended for this project during FY 1990.

2. (U) FY 1991 Planned Program:
   - (U) No RDT&E funding is plannned for FY 1991.

3. (U) FY 1992 Planned Program:
   - (U) Conceptual studies and preliminary development will begin.

4. (U) FY 1993 Planned Program:
   - (U) Detailed design and prototype selection.

5. (U) Program to Completion:
   - (U) Build prototype and final critical design review in 1994. Production begins in 1995 and ends in 1996.

D. (U) Work Performed By: Contractor has not been identified at this time.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY: Not applicable.

F. (U) PROGRAM DOCUMENTATION: SAC SON 18-82-R1, August 1987; Draft SAC ORD 18-82-R-1-I-II-III-B.

G. (U) RELATED ACTIVITIES: Modification supports the B-52H conventional upgrade program which gives the B-52H enhanced conventional capabilities.

Program Element: #0101113F Budget Activity: #3 - Strategic Programs
PE Title: B-52 Squadrons

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands): Not Applicable.

I. (U) International Cooperative Agreements: Not applicable.

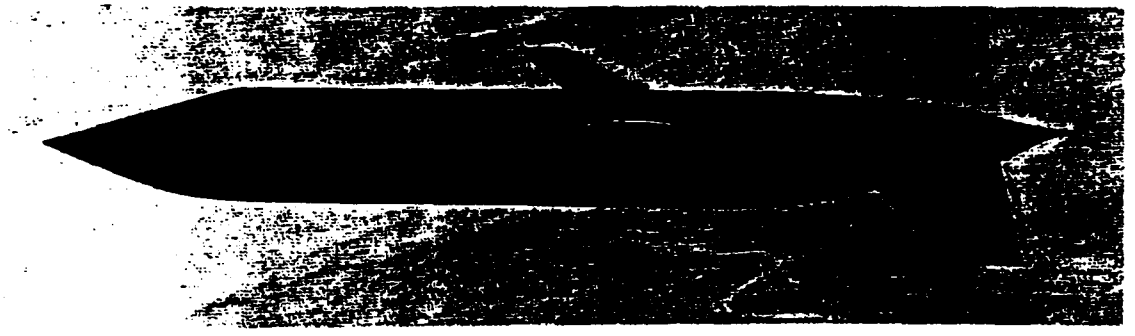
J. (U) MILESTONE SCHEDULE:

1.	(U) Complete FSD	September 1994
2.	(U) Begin Productiom	October 1995
3.	(U) Complete production	September 1996

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0101120F Budget Activity: #3 - Strategic Programs
PE Title: Advanced Cruise Missile

Project Title: Advanced Cruise Missile (ACM)



POPULAR NAME: ACM

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Major Contract	36,570	42,723	88,430	69,426	15,545
Support Contract	1,282	2,969	3,250	0	0
In-House Support	4,146	4,146	5,018	7,089	6,148
GFE/ Other	0	2,000	12,000	9,500	0
Total	41,998	51,838	108,698	86,015	21,693
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	(To Complete)
Program Milestones	FSD COMP	DAB IIIB			
Engineering Milestones					
T&E Milestones	OT&E COMP	FOT&E I	FOT&E II		
Contract Milestones	2ND SOURCE QUAL	FY 90/91 BUY	FY 92 BUY	FY 93 BUY	CONTRACT COMPLETION

Program Element: #0101120F Budget Activity: #3 - Strategic Programs
PE Title: Advanced Cruise Missile

B (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The ACM is a low-observable, air-launched, strategic cruise missile with significant improvements in range, accuracy, and survivability over the ALCM-B. Armed with a W-80 warhead, it is designed to counter advances in air and ground-based defenses in order to strike heavily defended, hardened targets at any location within the territory of any potential enemy. The ACM is designed for external carriage of the B-52F

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) ACM Full-Scale Development complete
   - (U) Second production source qualified
   - (U) Second source flight test complete
   - (U) DT&E completed

1. ( ) FY 1991 Program:
   - (U) DAB IIIB
   - (U) First Second Source Production Missile delivery
   - (U) Variant Phase I Completed
   - (U) Variant Full-Scale Development (Phase II) initiated.
   - (U) Variant design work initiated

2. (U) FY 1992 Planned Program:
   (U)
   - (U) Variant CDR
   - (U) Begin Variant captive carry tests

3. (U) FY 1993 Planned Program:
   - (U) Begin Variant fabrication and assembly
   - (U) Initiate/Complete Variant free flight tests
   - (U) Complete Variant captive carry tests

5. (U) Program to Completion:
   - (U) Complete FOT&E
   - (U) Complete regular ACM Production
   - (U) First Variant Delivery
   - (U) Complete Variant Production

D. (U) WORK PERFORMED BY: General Dynamics Corporation/Convair Division, San Diego, CA, was selected as the prime contractor in mid-April 1983. Contracts for the engine (Williams International, Ogden, UT) and aircraft integration (B-52 and the Common Strategic Rotary Launcher [CSRL]: Boeing-Wichita) were subsequently awarded. Congress supported, and the Air Force instituted, a second source (McDonnell Douglas Missile Systems Company, Titusville, FL).

(U) The ACM underwent a combined Developmental and Operational Test and Evaluation program that was completed in July 1990. The 31st Test and Evaluation Squadron (SAC), in conjunction with the 6510th Test Wing (AFFTC)

Program Element: #0101120F Budget Activity: #3 - Strategic Programs
PE Title: Advanced Cruise Missile

was the responsible test agency. The Systems Program Office (ASD/VC) will provide management and supply support until AFLC is able to accept complete management responsibility. AFLC depot item manager for the ACM system is the Oklahoma City Air Logistics Center (OC-ALC).

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: There have been no major technical changes

2. (U) Schedule Changes: Delivery of the first baseline missile was delayed four months due to a fuel pressurization bladder problem. Deliveries began in July 1990. The DAB IIIB decision was rescheduled from November 1990 to February 1991.

3. (U) Cost Changes: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) SAC Statement of Need, dated Aug 82
- (U) Program Baseline, Nov 89
- (U) LRIP (Sufficiency Review), Jul 86
- (U) Statement of Need, Mar 87
- (U) ACM Integrated Logistics Support Plan, Oct 87
- (U) ACM Test and Evaluation Master Plan, Jan 90
- (U) System Operational Requirements Document (SORD) for ACM, Nov 90

G. (U) RELATED ACTIVITIES:

- (U) There is no duplication of effort within the Air Force or the Department of Defense.

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

- (U) Procurement (1000 Missiles)

	FY1990 Actual	FY1991 Estimate	FY1992 Estimate	FY1993 Estimate	To Compl	Total Pgm
Cost	314,500	454,169	517,695	465,489	994,600	4,603,100

I. (U) COOPERATIVE AGREEMENTS: Not Applicable

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
(U) GD/C Free Free Flights	Jul 90	15 of 24 Successful
(U) B-52 Captive Flights.	Sep 90	Completed

Program Element: #0101120F Budget Activity: #3 - Strategic Programs
PE Title: Advanced Cruise Missile

T&E ACTIVITY (PAST 36 MONTHS - CONTINUED)

		Jan 89
		Jul 89
(U)	Missile Environmental Test	Jul 90
(U)	Functional Ground Testing	Jun 89
(U)	MDMSC Free Flights	Sep 90
(U)	Dual Source Qualification Test	Dec 90

T&E ACTIVITY (TO COMPLETION)

Event		Date	Results
(U)	Multifunctional Ground Test	Jul 92	Ongoing
(U)	Variant Flight Tests	FY 92 - FY 94	Planned

FY 1993/1994 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0101142F Budget Activity: #3-Strategic Programs
PE Title: KC-135 Squadrons

A. (U) RESOURCES ($ in thousands)

Project Title Improved Aerial Refueling System (IARS)

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total
Improved Aerial Refueling Program (IARS)	2,171	3,541	14,968	17,350	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The IARS program is designed to fund several research and development projects that will improve the aerial refueling system of the KC-135 fleet. This requirement was established by SAC SON 001-87 which identified several deficiencies in the KC-135 refueling capability. The IARS program is phased to investigate changes to system deficiencies and improve the overall refueling capability of the aircraft, inter-and intra-service and NATO aerial refueling procedures. The program also includes Research and Development funds for the Multipoint Refueling program. The program will place wing mounted air refueling pods on the KC-135R to reduce a tanker shortfall and improve the efficiency and effectiveness of tactical aircraft employment and deployment.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments
   - (U) Nozzle light testing
   - (U) Improved Nozzle Testing
   - (U) Completed Low Altitude Refueling Study

2. (U) FY 1991 Accomplishments
   - (U) Crewmember functional analysis
   - (U) Engineering development for SAC AMP Mod
   - (U) Fuel panel human factors improvements
   - (U) Tanker Requirements scrub
   - (U) Nozzle flight tests

3. (U) FY 1992 Planned Program:
   - (U) Future Tanker Concept Requirements and Evaluation
   - (U) Cargo carrying enhancements
   - (U) Improved Boom Concept
   - (U) Start Multipoint Refueling R&D

4. (U) FY 1993 Planned Program:
   - (U) Future Concept Tanker Evaluation
   - (U) Cargo Carrying Enhancement
   - (U) Reliability and Maintainability Upgrade Identification Development and Test
   - (U) Multipoint Refueling R&D

5. (U) Program to Completion: This is a continuing effort to correct existing system deficiencies in order to meet the aerial refueling requirements of the next decade.

D. (U) WORK PERFORMED BY: Work has been performed by the J.C. Carter Co., Costa Mesa, CA. Sergant Fletcher * Monte, CA. XAR Industries, City of Industries, CA., Aeronautical System Division, 4950th Test Wing, and 6150 Test Wing.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: None
3. (U) COST CHANGES: Increased funding in FY 1992 and 1993 is due to the start of the Multipoint Refueling program. Multipoint Refueling will add 2 wing mounted air refueling pods to the KC-135R. The pods will allow the simultaneous refueling of 2 to 3 fighter aircraft which reduces the number of tanker aircraft needed to support fighter aircraft employment and deployment. Multipoint, which reduces off-load time and increases the fuel available on all strike aircraft at the end of air refuelling, will enhance the effectiveness and efficiency of tactical strike packages.

F. (U) PROGRAM DOCUMENTATION:

- (U) SAC SON 001-87, 27 May 87
- (U) SAC SON 013-86, 27 May 87
- (U) PMD 7129(11), 28 Feb 90 (S)

G. (U) RELATED ACTIVITIES: None

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Procurement of wing mounted refueling pods funded in KC-135 Squadrons (PE 11142F)

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) MILESTONE SCHEDULE: Milestones for this program are based on making improvements to the KC-135 Aerial Refueling System which are required to enhance reliability, maintainability, efficiency and safety.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0101213F
PE Title: Minuteman Squadrons
Project Number: 133B
Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES ($ in Thousands)
Project Title: Rapid Execution and Combat Targeting

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
REACT	60,000	81,005	42,100	17,160	0	242,500
Minuteman Squadrons	0	0	4,082	4,346	Cont	TBD
Reentry Systems Launch Program	--	--	7,777	8,520	Cont	TBD
Total	60,000	81,005	53,959	30,026	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Numerous communications and weapon system modifications to Minuteman Launch Control Centers (LCCs), coupled with engineering compromises and space limitations, over time, have task-saturated crew members. Concurrently, weapon system mission requirements increased in complexity and the command and monitoring functions became more time constrained. The resultant environment severely taxes crew abilities to effectively process National Command Authority execution directives in a timely fashion, especially during critical phases immediately preceding a missile launch. Additionally, some LCC components have become increasingly difficult and costly to support. The Rapid Execution and Combat Targeting (REACT) Program was created to address common concerns with warfighting responsiveness, combat capabilities, EWO effectiveness, message processing flexibility, and weapon system operability and supportability in the future. The program will modify Minuteman and Peacekeeper Launch Control Centers (LCCs) and their associated trainers, correct operability and supportability problems, improve combat crew responsiveness to launch directives, and provide rapid combat retargeting capability. The Rapid Message Processing modification significantly reduces crew reaction time, while increased rapid retargeting capability dramatically reduces the weapon system's response time to enhance our capabilities against mobile targets. A new Weapon System Controller (WSC) provides significantly increased system capacity and eliminates supportability difficulties presented by the current aging WSC. The new console with dual workstations meets the Congressional requirement for console commonality between Minuteman and all other LCCs.

In addition to REACT, the Program Element contains funds for Minuteman system engineering and research support. Additionally, beginning in 1992, it contains funds for the Reentry System Launch Program (RSLP). Minuteman is projected to maintain its deterrent role until well into the next century. These funds are used to ensure that the system remains current and viable by providing subsystem modification options, which meet SAC mission objectives, as well as address AFLC supportability/maintainability issues. Commonality of modification designs with the Peacekeeper and Small ICBM systems minimizes

Program Element: # 0101213F
PE Title: Minuteman Squadrons
Project Number: 133B
Budget Activity: #3 - Strategic Programs

costs associated with development, production, and the maintenance life cycle. These funds serve to evaluate issues associated with the implementation, schedule and cost of elements recommended for application in the weapon system master plan and twenty year technical schedule derived during the AFLC/AFSC/SAC long range plan quarterly meetings.

RSLP provides research and development launch support to the Ballistic Missile Technology program.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Completed human-machine interface prototyping in conjunction with the operating command.
   - (U) Continued REACT hardware and software development through the various subcomponent preliminary design reviews for both the weapon system control and REACT communication elements, respectively; and hardware preliminary design review, as well as software specification review, for the missile procedure trainer.
   - (U) Began specific design of REACT hardware and software for the first Minuteman configuration (AM/PCKR).
   - (U) Developed Acquisition Strategy Plan (ASP) and Request for Proposal (RFP) for production.

2. (U) FY 1991 Planned Program:
   - (U) Begin certification of first REACT Minuteman configurations at the Critical Design Review.
   - (U) Begin integration testing.
   - (U) BMO conduct sole source selection and award contract and ESD exercise their first option for production of the first configuration. This is currently scheduled for June 1991.
   - (U) Investigate possible application of Peacekeeper/Small ICBM flight processors for use in Minuteman II/III for potential replacement of the guidance computer.
   - (U) Investigate low cost common ICBM guidance and control inertial measurements units (IMU) with an emphasis on maintainability.

3. (U) FY 1992 Planned Program:
   - (U) Continue integration testing and begin weapon system testing.
   - (U) Conduct functional and physical configuration audits of the REACT Communications Element.
   - (U) Identify and evaluate options for replacing non-rechargeable lithium batteries approaching shelf life expiration with rechargeable high energy power sources to minimize life cycle costs.
   - (U) Investigate options for upgrading existing silos to hardness levels which can extract a significant price to attack.
   - (U) Define delta costs associated with reconfiguration of the REACT weapon system in light of current Air Force START force structures.
   - (U) Support RSLP as required.

4. (U) FY 1993 Planned Program:
   - (U) Conduct maintainability demonstration.
   - (U) Obtain nuclear certification of REACT software.
   - (U) Begin IOT&E.
   - (U) Begin weapon system installation and checkout leading to First Asset Delivery (FAD) as outlined by SAC in April 1993.

Program Element: # 0101213F
PE Title: Minuteman Squadrons
Project Number: 133B
Budget Activity: #3 - Strategic Programs

- (U) Investigate non-destructive testing techniques for system checkout, thereby minimizing the requirement for expendable test assets.
- (U) Investigate disposal techniques for application to potential missile deactivation resulting from anticipated Strategic Arms Reduction Treaty (START) limitations.
- (U) Investigate potential reentry vehicle replacement options in common with Peacekeeper/Small ICBM in anticipation of shortfalls driven by supportability factors.
- (U) Support RSLP as required.

5. (U) Program to Completion:
   - (U) Achieve Last Asset Delivery (LAD) in 2Q FY 95.

D. (U) WORK PERFORMED BY: Ford Aerospace was awarded the WSC element of the REACT contract, overseen by Ballistic Missile Organization (BMO), and GTE was awarded the REACT communications element, overseen by Electronic Systems Division (ESD). The responsible Air Force agency for the overall project is BMO.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:
1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: Due to assumption of RSLP into the Program Element, the following funds were added: FY 92: $7.8M, FY 93: $8.5M.

F. (U) PROGRAM DOCUMENTATION:
- (U) SAC SON 6-85, ICBM Rapid Message Processing and Retargeting, 22 Aug 86.
- (U) SAC SON 14-86, ICBM Launch Control Center Integration, 8 Nov 87.
- (U) SAC ROC 2-75, Ground Wave Emergency Network
- (U) SAC ROC 6-70, Milstar
- (U) SAC SORD 14-86-I/II, Rapid Execution and Combat Targeting, 20 Dec 88.

G. (U) RELATED ACTIVITIES:
- (U) Automated Emergency Action Message Processing and Dissemination System (AEPDS) program managed by the National Security Agency is essential for REACT to meet the rapid message processing timeline requirements in the SAC SORD. Integration of this program is necessary to insure there continues to be no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands):
(U) Missile Procurement (BA 4):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost*	0	96,132	120,951	5,245	0	222,328

*Only REACT production funds

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1. (U) FSD Contract award	Apr 1989
2. (U) System Design Review	Jul 1989
3. (U) Preliminary Design Review	Mar 1990
4. (U) Critical Design Review	Mar 1991
5. (U) Production Initiation	Jun 1991
6. (U) FAD	Apr 1993
7. (U) LAD	Jan 1995

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: 0101312F Budget Activity: #3 - Strategic Programs
PE Title: Post Attack Command and Control System

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Post Attack Command and Control System	1177	1267	1314	2274	Cont	TBD
Total	1177	1267	1314	2274	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: To provide a survivable command and control capability for the Single Integrated Operational Plan Commanders in Chief to support the National Command Authority during all phases of a limited or general war. Supports electromagnetic pulse (EMP) vulnerability surveillance of all aircraft of the Worldwide Airborne Command Post (WWABNCP) fleet, including those assigned to Commanders in Chief of the Strategic Air Command, European Command, Atlantic Command and Pacific Command, and the National Emergency Airborne Command Post.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

(U) Project Number, Project Title: WWABNCP EMP Surveillance Program
The WWABNCP System Program Office conducts, on a continuing basis, an EMP engineering surveillance program for the EC-135 and E-4B aircraft.
This effort establishes and analyzes EMP design specifications for new systems, support subsystem, component, and system testing, investigates new techniques to achieve improved EMP protection, and provides a continuing analysis of the EMP survivability of the WWABNCP.

(U) FY 1990 Accomplishments:
- (U) Continued planning activities, acquired long lead items for FY 1991 system test.
- (U) Conducted hardness maintenance/hardness surveillance.
- (U) Continued survivability/vulnerability analysis of acquisition and modification programs.
- (U) Started the FY91 system test.

(U) FY 1991 Planned Program:
- (U) Complete major systems test.
- (U) Conduct hardness maintenance/hardness surveillance.

Program Element: #0101312F Budget Activity: #3 - Strategic Programs
PE Title: Post Attack Command and Control System

- (U) Continue survivability/vulnerability analysis of acquisition and modification programs.
- (U) Analyze FY91 test data and identify corrective actions.
- (U) Setup Hardness Review Board.

(U) FY 1992 Planned Program:
- (U) Initiate corrective actions based on the FY91 test data.
- (U) Conduct hardness maintenance/hardness surveillance.
- (U) Continue survivability/vulnerability analysis of acquisition and modification programs.
- (U) Conduct Hardness Review Board.
- (U) Initiate actions from the Hardness Review Board.

(U) FY 1993 Planned Program:
- (U) Conduct major systems test.
- (U) Conduct hardness maintenance/hardness surveillance.
- (U) Continue survivability/vulnerability analysis of acquisition and modification programs.
- (U) Initiate actions from the Hardness Review Board.

(U) Work Performed By: WWABNCP SPO (Oklahoma City ALC) with TRW as prime contractor. EMP tests conducted by Air Force Weapons Lab (Kirtland AFB NM).

(U) Related Activities:
- (U) Program Element #0101316F Strategic Air Command Communications.
- (U) Program Element #0303601F Air Force Satellite Communications.
- (U) Program Element #0302015F National Emergency Airborne Command Post.
- (U) Program Element #0303131F Air Force Support to the Minimum Essential Emergency Communications Network.
- (U) Program Element #0303603F Milstar
- (U) Program Element #0102433F Nuclear Detonation Detection System.
- (U) Program Element #0604711F System Survivability.
- (U) Program Element #0604747F Electromagnetic Radiation Test Facilities.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):
Not Applicable

(U) International Cooperative Agreements: Not Applicable

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0101313F Budget Activity: #3 - Strategic Programs
PE Title: War Planning ADP - SAC

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
N/A	Strategic Mission Data Preparation System (SMDPS)					
	17,700	3,678	5,976	7,921	Cont.	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The Strategic Air Command (SAC) Strategic War Planning Automated Data Processing (ADP) effort supports changes designed to increase and add new capability to the ADP equipment, software and communications links used to plan and execute the strategic bomber, intercontinental ballistic missile and sea launched ballistic missile components of the nuclear TRIAD. Requirements to optimize force application dictates an ADP capability which can effectively integrate numerous nuclear delivery vehicle sorties while rapidly reacting to changes in enemy force deployment and composition.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN BOTH FY92 & FY93:

1. (U) Nuclear Mission Planning and Production System (NMPPS): Project supports ongoing force level war planning ADP upgrades. This allows the new automated mission planning support equipment for strategic bombers and their weapon systems to be fully integrated into the new hardware and software architecture of the Strategic War Planning ADP. This effort consolidates several independent mission planning actions within ongoing and new strategic bomber/weapon acquisition programs. The overall objective is to ensure that programs can be accommodated within SAC's War Planning ADP. Using and increasing the capability of common automated hardware and software architecture will facilitate interpretability and decrease total acquisition costs for future weapon systems.

(U) FY 1990 Accomplishments:
- (U) Developed SMDPS Phase II software update to increase system capability (Tape 8.1) to support growing SIOP requirements.
- (U) Provided Interface Management Services support to develop acquisition process for cutover from SMDPS Phase II to SMDPS Phase III/NMPPS.
- (U) SAC decision on NMPPS approach.

(U) FY 1991 Planned Program:
- (U) Contract for annual software update for tapes 9-13 (FY 1992-FY 1995) allowing the SIOP to incorporate SAC's updated weapons and force level planning (Block 1).
- (U) Deliver Tape 9.

Program Element: #0101313F Budget Activity: #3 - Strategic Programs
PE Title: War Planning ADP - SAC

- (U) Acquisition of some new hardware.
- (U) Complete NMPPS Blocks II and III and develop the A-spec and begin software design engineering.
- (U) Develop and incorporate a deployable capability into the next tape.
- (U) Generate cruise missile targeting information from the Data Transfer Unit Cartridge (DTUC).
- (U) Develop Automatic Calculation of Flight Planning Data.

(U) FY 1992 Planned Program:
- (U) Increase in funding due to Aug 90 AF decision to shift from an internal SAC program to contracted activities under ESD/SZW.
- (U) Deliver Tape 10 to operational user.
- (U) Development begins on the automated mission planning packages within eight hours at the unit level.
- (U) Initial acquisition of new hardware suites.
- (U) Continue Weapon System Interface (WSI) integration.
- (U) Continue Cruise Missile targeting capability development.

(U) FY 1993 Planned Program:
- (U) Increase in funding due to Aug 90 AF decision to shift from an internal SAC program to contracted activities under ESD/SZW.
- (U) Deliver Tape 11 to operational user.
- (U) Development begins on interactive route development system and full automation of mission planning process.
- (U) Begin integration of weather and other unique mission critical stand-alone systems.
- (U) Complete acquisition of hardware suites (34 total).

(U) Work Performed By: The program is managed by the Director of Strategic C3 Systems, Electronic Systems Division, Hanscom AFB, MA. Boeing Military Aircraft, Wichita, KS. is under contract to provide annual operational tape upgrades (Tapes 1-8.1) A new contract is being competed for award in April 91 for Tapes 9-13 of Block I. By Dec 91, plan to compete and award the developmental contract for the next NMPPS (Blocks II and III).

(U) Related Activities:
- (U) Project consolidates automated war planning in numerous strategic weapons programs.
- (U) Program Element #0101113F (B-52 Squadrons)
- (U) Program Element #0604226F (B-1B)
- (U) Program Element #0604240F (B-2)
- (U) Program Element #0101120F (Advanced Cruise Missile)
- (U) Program Element #0604244F (Short Range Attack Missile II)
- (U) Program Element #0207316F (Tacit Rainbow)
- (U) This effort is being conducted in conjunction with the Air Force Automated Mission Planning System (AFAMPS) (PE #0208006F) and Mission Support Systems (MSS II) (PE #0207128F) projects. There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable

(U) International Cooperative Agreements: Not Applicable

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102310F
PE Title: Cheyenne Mountain Upgrade (CMU) - Integrated TW/AA

Budget Activity: # 3 - Strategic Programs

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
0001 CMU	103,914	106,364	123,018	165,692	177,800	1,299,900
0002 Integrated TW/AA	2,706	8,109	9,982	10,801	40,200	91,800
Total	106,620	114,473	133,000	176,493	218,000	1,321,700

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program funds the replacement systems for the Tactical Warning/Attack Assessment (TW/AA) command, control, and communications (C^3) system centralized within the Cheyenne Mountain Complex (CMC). These replacement systems are designed to incrementally modernize and upgrade the current operational systems and facilities. This integrated TW/AA architecture responds to a flexible, coordinated (missile, air, and space) threat. The program is divided into two projects: The six CMU acquisitions comprise the project titled "CMU" and the system engineering (to coordinate and integrate CMU into the TW/AA "system of systems") is titled "Integrated TW/AA." These projects will provide the Commanders-in-Chief, United States Space Command (USCINCSPACE) and North American Aerospace Defense Command (CINCNORAD), the National Command Authorities (NCA), the Joint Chiefs of Staff, and other commanders, with timely and reliable Command, Control, and Communication (C^3) systems capable of meeting TW/AA information needs of the United States into the next century.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102310F
PE Title: Cheyenne Mountain Upgrade (CMU) - Integrated TW/AA
Project Number: 0001
Budget Activity: # 3 - Strategic Programs

A. (U) RESOURCES ($ in Thousands)

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
CMU	103,914	106,364	123,018	165,692	177,800	1,229,900

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The CMU project responds to the requirement to provide national decision makers with accurate, timely, reliable, and unambiguous Integrated Tactical Warning/Attack Assessment (TW/AA) information. These systems will provide 1) survivable communications, 2) integrated warning of ballistic missile, atmospheric, and space threats, 3) standard user data processing and displays, and 4) a fully mission capable early/trans-attack correlation center and backup. The modernization achieved through these upgrades will also provide the capability to address the enhanced threat that has evolved since system implementation, while simultaneously taking advantage of the great strides in technology that have occurred over the same period.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Completed construction of Offutt Processing and Correlation Center (OPCC), Offutt AFB, NE
   - (U) Completed Formal Qualification Testing (FQT) of Space Defense Operations Center Phase 4B (SPADOC 4B) ahead of schedule
   - (U) Installed SPADOC 4B software/hardware at government test facility, Peterson AFB, CO
   - (U) Completed facility preparation for Communications System Segment Replacement (CSSR) Message Processing and Distribution System (MPDS) and "red" technical control equipment

2. (U) FY 1991 Planned Program:
   - (U) Install CSSR's MPDS and "red" tech control
   - (U) Complete FQT on Survivable Communications Integration System (SCIS) and install equipment at first group of sites
   - (U) Award SPADOC 4C contract and begin software development
   - (U) Complete Granite Sentry (missile warning) software delivery

3. (U) FY 1992 Planned Program:
   - (U) Establish interface between CSSR and Command Center Processing and Display System-Replacement (CCPDS-R)
   - (U) Complete installation of SCIS equipment at all sites
   - (U) Complete FQT on CCPDS-R common subsystem (msl wrng) software
   - (U) Complete Granite Sentry (space warning) software implementation and Granite Sentry/SPADOC/CSSR interfaces
   - (U) Complete intefaces with CSSR for all CMU systems and phases that have reached IOC.

Program Element: #0102310F
PE Title: Cheyenne Mountain Upgrade (CMU) - Integrated TW/AA
Project Number: 0001
Budget Activity: # 3 - Strategic Programs

4. (U) FY 1993 Planned Program:
   - (U) Communications System Segment Replacement (CSSR) Initial Operations Capability (IOC)
   - (U) Command Center Processing & Display System-Replacement (CCPDS-R) common subsystem IOC; Formal Qualification Testing (FQT) for CCPDS-R's Strategic Air Command-unique subsystem
   - (U) Install CSSR in Offutt Processing & Correlation Center (OPCC)
   - (U) Complete CSSR interface with all Granite Sentry phases to date
   - (U) Complete interface with CSSR for all CMU systems and phases that have reached IOC.

5. (U) Program to Completion:
   - (U) Survivable Communications Integration System (SCIS) interface with MILSTAR and IOC, FY95
   - (U) CCPDS-R IOC, FY95
   - (U) Granite Sentry Pre-Planned Product Improvement (P^3I)/IOC, FY95
   - (U) Space Defense Operations Center (SPADOC) Phase 4C IOC, FY95
   - (U) OPCC IOC, FY96
   - (U) CMU Full Operational Capability (FOC), FY96

D. (U) Work Performed By: SCIS--E-Systems, St Petersburg, FL; SPADOC 4--Ford Aerospace, Colorado Springs, CO; CSSR--GTE, Waltham, MA; CCPDS-R--TRW, Redondo Beach, CA; Granite Sentry--Martin Marietta Corp, DEC, and Idaho National Energy Lab; OPCC--tasks provided through other CMU systems' contracts. Program Office technical support provided by MITRE, Bedford, MA, and CTA, Bedford, MA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: Due to underestimate of software lines of code (SLOC) needed to develop Granite Sentry (Missile Warning), delivery will be delayed into FY 1991. Development of SPADOC 4B is several months ahead of schedule. Development of SCIS hardware and software interface will not be completed on current schedule. Alternatives, to insure delay in SCIS installations don't affect CMU integrated schedule, are being reviewed. Granite Sentry changes will not affect CMU FOC.
3. (U) COST CHANGES: None.

Program Element: #0102310F
PE Title: Cheyenne Mountain Upgrade (CMU) - Integrated TW/AA

Project Number: 0001
Budget Activity: # 3 - Strategic Programs

F. (U) PROGRAM DOCUMENTATION:
- (U) Acquisition Decision Memorandum on the Cheyenne Mountain Upgrade (CMU) Program, 25 Oct 89,
- (U) Acquisition Program Baseline (APB) Cheyenne Mountain Upgrade (CMU) Programs, 12 Feb 90
- (U) PMD 9247 (2)/0102310F, Cheyenne Mountain Upgrade (CMU) Program, 6 Jul 90
- (U) AFSPACECOM SORD for Cheyenne Mountain Upgrade (CMU) Program, 7 Aug 90
- (U) TEMP for Cheyenne Mountain Upgrade (CMU) Program (draft)

G. (U) RELATED ACTIVITIES: In accordance with Defense Acquisition Board (DAB) direction, Sep 89, four program elements (0102310F, 0102311F, 0102313F, 0102436F) were consolidated into program element 0102310F

- (U) Program Element #0102310F/0102313F, Integrated TW/AA System
- (U) Program Element #0102423F, Ballistic Missile Early Warning System
- (U) Program Element #0102432F, Sea Launched Ballistic Missile Early Warning System-PAVE PAWS
- (U) Program Element #0102424F, SPACETRACK
- (U) Program Element #0604406F, Antisatellite
- (U) Program Element #0305130F, Consolidated Space Operations Center
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands): (Includes spares)

(U) Other Procurement (BA # 3):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	44,703	9,991	36,380	33,206	Cont	TBD

(U) Military Construction: Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) MILESTONE SCHEDULE:

1.	(U) Offutt Processing & Correlation Center (OPCC) MILCON completed	Aug 90
2.	(U) Communications System Segment Replacement (CSSR) "red" technical control installation	Apr 91
3.	(U) Space Defense Operations Center (SPADOC) Phase 4B IOC	May 91
4.	(U) Granite Sentry (Missile Warning) Initial Operational Capability (IOC)	Aug 91
5.	(U) Granite Sentry/CSSR interface	2nd Qtr FY 1992
6.	(U) Survivable Communications Integration System (SCIS) IOC	2nd Qtr FY 1992

Program Element: #0102310F
PE Title: Cheyenne Mountain Upgrade (CMU) - Integrated TW/AA

Project Number: 0001
Budget Activity: # 3 - Strategic Programs

7.	(U) Command Center Processing & Display System-Replacement (CCPDS-R) (common subsystem) IOC	4th Qtr FY 1993
8.	(U) Granite Sentry/CCPDS-R/SPADOC 4C interfaces	4th Qtr FY 1993
9.	(U) Granite Sentry (NORAD Command Center) IOC	2nd Qtr FY 1994
10.	(U) CSSR (additional operational capability) IOC	4th Qtr FY 1994
11.	(U) SCIS (new media/MILSTAR) IOC	FY 1995
12.	(U) CCPDS-R (Processing & Display System (PDS)/ Strategic Air Command (SAC)-unique/OPCC subsystems) IOCs	FY 1995
13.	(U) Granite Sentry Pre-Planned Product Improvement	FY 1995
14.	(U) SPADOC 4C IOC	FY 1995
15.	(U) Granite Sentry (OPCC) IOC	FY 1996
16.	(U) CMU Full Operational Capability (FOC)	FY 1996

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102310F
PE Title: Cheyenne Mountain Upgrade (CMU) - Integrated TW/AA
Project Number: 0002
Budget Activity: # 3 - Strategic Programs

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
ITW/AA	2,706	8,109	9,982	10,801	40,200	91,800

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides the system engineering framework through which the Air Force will ensure the interoperability of the CMU systems' acquisitions and their interface with the Integrated Tactical Warning/Attack Assessment (TW/AA) system. Integration will be ensured through the implementation of coordinated technical standards and communications protocols and by development of engineering designs for standardized processing and display of the air, space, and missile attack warning data. Management of these TW/AA assets as an integrated system is crucial to insure accurate, timely, and unambiguous warning and assessment information to support national decision making for force survivability.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Continued identifying all CMU system and program interfaces
   - (U) Continued resolving any potential interface disconnects
   - (U) Tracked acquisition performance to program baseline
   - (U) Kept System Executive Manager (AFSPACECOM/CC) informed via quarterly program reviews.

2. (U) FY 1991 Planned Program:
   - (U) Continue identifying TW/AA system interfaces and resolving disconnects between CMU and other programs
   - (U) Provide systems engineering/integration support to Survivable Communications Integration System (SCIS) and Communications System Segment Replacement (CSSR) during installation and checkout in Cheyenne Mountain AFS, CO.
   - (U) Track acquisition performance to program baseline
   - (U) Keep System Executive Manager (AFSPACECOM/CC) informed via quarterly program reviews.

3. (U) FY 1992 Planned Program:
   - (U) Continue identifying TW/AA system interfaces and resolving disconnects between CMU and other programs
   - (U) Provide systems engineering/integration support to Granite Sentry and Command Center Processing & Display System-Replacement (CCPDS-R) interface during installation and checkout in Cheyenne Mountain AFS, CO
   - (U) Track acquisition performance to program baseline
   - (U) Keep System Executive Manager (AFSPACECOM/CC) informed via quarterly program reviews.
   - (U) Identify/resolve CMU systems' interfaces with CSSR

Program Element: #0102310F
PE Title: Cheyenne Mountain Upgrade (CMU) - Integrated TW/AA
Project Number: 0002
Budget Activity: # 3 - Strategic Programs

4. (U) FY 1993 Planned Program:
   - (U) Continue resolving disconnects between CMU and other programs
   - (U) Provide systems engineering/integration support to Communications System Segment Replacement (CSSR)/Granite Sentry during installation and checkout in Offutt Processing & Correlation Center (OPCC), Offutt AFB, NE
   - (U) Track acquisition performance to program baseline
   - (U) Keep System Executive Manager (AFSPACECOM/CC) informed via quarterly program reviews.
   - (U) Identify/resolve CMU systems' interfaces with CSSR

5. (U) Program to Completion:
   - (U) Complete resolution of all potential disconnects between CMU and other Tactical Warning/Attack Assessment (TW/AA) program interfaces
   - (U) Provide systems engineering/integration support to Survivable Communications Integration System (SCIS), Space Defense Operations Center (SPADOC) Phase 4C, and Command Center Processing & Display System-Replacement (CCPDS-R) installation/checkout in Cheyenne Mountain AFS
   - (U) Provide systems engineering/integration support to CCPDS-R installation at OPCC
   - (U) Provide system analysis/integration support for CMU Full Operational Capability (FOC) checkout

D. (U) Work Performed By: This project is managed by Air Force Systems Command's Electronic Systems Division (ESD). Technical support is provided by MITRE, Bedford, MA, and Carnegie-Mellon Software Engineering Institute (SEI).

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: None
3. (U) COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION:
   - (U) Acquisition Decision Memorandum on the Cheyenne Mountain Upgrade (CMU) Program, 25 Oct 89,
   - (U) Acquisition Program Baseline (APB) Cheyenne Mountain Upgrade (CMU) Programs, 12 Feb 90
   - (U) PMD 9247 (2)/0102310F, Cheyenne Mountain Upgrade (CMU) Program, 6 Jul 90
   - (U) AFSPACECOM SORD for Cheyenne Mountain Upgrade (CMU) Program, 7 Aug 90
   - (U) TEMP for Cheyenne Mountain Upgrade (CMU) Program (draft)

Program Element: #0102310F
PE Title: Cheyenne Mountain Upgrade (CMU) - Integrated TW/AA
Project Number: 0002
Budget Activity: # 3 - Strategic Programs

G. (U) RELATED ACTIVITIES: In accordance with Defense Acquisition Board (DAB) direction, Sep 89, four progam elements (0102310F, 0102311F, 0102313F, 0102436F) were consolidated into program element 0102310F

- (U) Program Element #0102310F/0102313F, Integrated TW/AA System
- (U) Program Element #0102423F, Ballistic Missile Early Warning System
- (U) Program Element #0102432F, Sea Launched Ballistic Missile Early Warning System-PAVE PAWS
- (U) Program Element #0102424F, SPACETRACK
- (U) Program Element #0604406F, Antisatellite
- (U) Program Element #0305130F, Consolidated Space Operations Center
- (U) There is no unnecessay duplication of effort within the Air Force or the Department of Defense

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands): None

I. (U) International Cooperative Agreements: Not Aplicable

J. (U) MILESTONE SCHEDULE: This is a sustaining engineering effort and there are no distinct milestones.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102325F
PE Title: Joint Surveillance System (JSS)
Budget Activity: #3-Strategic Programs

A. (U) RDT&E RESOURCES ($ in Thousands)

Project Number & Title		FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2976	Joint Surveillance System Connectivity	197	637	658	693	Cont	TBD
2996	FAA/AF Radar	840	1,003	4,732	4,353	Cont	TBD
TOTAL		1,037	1,640	5,390	5,046	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Joint Surveillance System (JSS) provides for air surveillance and command and control of air defense forces for airspace sovereignty of North America.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2976, Joint Surveillance System Connectivity:
The Joint Surveillance System Connectivity provides improvements to strategic air defense command, control and communications by integrating new sensor data and enhancing command center crosstell capabilities.

(U) FY 1990 Accomplishments:
- (U) Initiated competitive procurement of Advanced Interface Control Unit (AICU) to provide connectivity with OTH-B and Navy ROTHR sensor data

(U) FY 1991 Planned Program:
- (U) Award contract for Advanced Interface Control Unit

(U) FY 1992 Planned Program:
- (U) Conduct AICU System Testing
- (U) Install and Integrate AICU, Block A at 4 CONUS SOCCs
- (U) Activate AICU software support/test bed
- (U) Study/prototype atmospheric connectivity improvements

(U) FY 1993 Planned Program:
- (U) Activate AICU, Block A at 4 CONUS SOCCs
- (U) Study/prototype atmospheric connectivity improvements

(U) Work Performed By: Air Force program management for the JSS Region and Sector Operations Control Centers is by Air Force Logistics Command,

Program Element: #0102325F
PE Title: Joint Surveillance System (JSS)

Budget Activity: #3-Strategic Programs

Wright-Patterson AFB, OH. The prime contractor for the JSS ROCCs/SOCCs is Hughes Aircraft Company, Fullerton, CA. Management of the Joint Surveillance System Connectivity is by the Electronic Systems Division of Air Force Systems Command, Hanscom AFB, MA.

(U) Related Activities:
- (U) Connectivity with OTH-B (0102417F), ROTHR (0604725N)
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds (& in Thousands):

(U) Other Procurement BA (63)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	9,344	6,507	12,847	18,814	Cont	TBD

(U) Military Construction: Not applicable.

(U) International Cooperative Agreements: The JSS program upgrades the JSS ROCCs/SOCCs which are shared with Canada on a reimbursable basis part of the North American Air Defense Modernization Memorandum of Understanding signed in 1985 by the US Secretary of Defense and the Canadian Minister of Defense. This allows Canada to implement cost-effective and operationally consistent changes to their JSS ROCCs. There are presently no international commitments or cost-sharing as it pertains to U.S. upgrade initiatives relating to the JSS.

2. (U) Project 2996, FAA/AF Radar Replacement (FARR): The FAA/AF Radar Replacement (FARR) program will replace forty (40) existing JSS search, beacon, and height-finding radars with solid-state, three-dimensional radars to improve mission performance and reduce operation and maintenance costs. This saves the Air Force over $48 million/year in support costs and over 1,000 critical manpower authorizations.

(U) FY 1990 Accomplishments:
- (U) Provided contractor system engineering support for the FARR Joint Program Office (JPO) which included FARR system design and modification, test and evaluation, and critical design reviews.

(U) FY 1991 Planned Program:
- (U) Continue contractor system engineering support for FARR JPO.

(U) FY 1992 Planned Program:
- (U) Continue contractor system engineering support for FARR JPO.
- (U) Support site preparation, radar production, installation, test and system checkout.

Program Element: #0102325F
PE Title: Joint Surveillance System (JSS)

Budget Activity: #3-Strategic Programs

(U) FY 1993 Planned Program:
- (U) Continue contractor system engineering support for FARR JPO.
- (U) Support site preparation, radar production, installation, test and system checkout.

(U) Program to Completion:
- (U) Continue site preparation, radar production, installation, test, and system check-out.
- (U) Complete system acceptance and declare Full Operational Capability by Fiscal Year 1995.

(U) Work Performed By: The Federal Aviation Agency is the lead acquisition agency for the FAA/AF Radar Replacement Program in accordance with a 19 November 1984 sub-agreement (as amended by Amendment #1, dated 1 September 1988) to FAA/AF National Agreement (NAT) 711. The FAA and the Air Force have established a Joint Program Office at HQ FAA, Washington, D.C., for this procurement.

(U) Related Activities:
- (U) FAA/Air Force National Agreement 614 pertains.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):

(U) Other Procurement BA (63)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	74,746	55,445	54,535	57,831	Cont	TBD
Military Construction	10,700	0	0	0	0	10,700

(U) International Cooperative Agreements: N/A

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102411F Budget Activity: # 3 - Strategic Programs
PE Title: Surveillance Radar Stations/Sites

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2980 North Atlantic Defense System (NADS)	4,932	6,518	11,779	7,475	Cont	TBD
3159 Caribbean Basin Radar Network (CBRN)	1,307	999	1,240	1,253	Cont	TBD
TOTAL	6,239	7,517	13,019	8,728	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element funds strategic air defense improvements in the North Atlantic and the Caribbean, and funds the operation and support of existing as well as new air defense systems in both regions.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) 3159 Caribbean Basin Radar Network: Provides ground-based radar systems and upgraded C^3I capability in the Caribbean. The Caribbean Basin Radar Network will support attack warning, threat assessment, control of air defense/tactical forces, air traffic management, and drug and arms interdiction. This project supports the US Commander-in-Chief Southern Command (USCINCSOUTH) and US Commander-in-Chief Atlantic Command (USCINCLANT).

(U) FY 1990 Accomplishments:
- (U) RDT&E funds provided systems engineering and program office support which includes CBRN system design and modification, test and evaluation and critical design reviews in support of site installation in the Dominican Republic and San Andres Island, Colombia.

(U) FY 1991 Planned Program:
- (U) RDT&E funds provide systems engineering and program office support to begin facilities construction monitoring, site installation and testing for six remaining CBRN baseline sites.

(U) FY 1992 Planned Program:
- (U) RDT&E funds provide systems engineering and program office support to complete facilities construction monitoring, site installation and testing for CBRN baseline sites.

Program Element: #0102411F Budget Activity: # 3 - Strategic Systems
PE Title: Surveillance Radar Stations/Sites

(U) FY 1993 Planned Program:
- (U) RDT&E funds provide systems engineering and program office support to complete procurement and installation of CBRN secure communications capability. Funds also support installation of a CBRN site on the Yucatan Peninsula.

(U) WORK PERFORMED BY: Efforts are managed by the Electronic Systems Division, Hanscom AFB, MA. Technical support is provided by MITRE Corporation, Burlington, MA; Electromagnetic Compatibility Analysis Center, Annapolis, MD. Westinghouse Corp, Baltimore MD is the CBRN Contractor.

(U) RELATED ACTIVITIES:
- (U) Program Element #0102412F, DEW Radar Stations
- (U) Program Element #0102417F, Over-the-Horizon Backscatter (OTH-B) Radar
- (U) Program Element #0102325F, Joint Surveillance System,
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

(U) Other Procurement (BA 63) (Includes Initial Spares):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	86,442*	3,667	13,000**	28,300**	Cont	TBD

* Includes $16.3M requested but not yet approved by Congress to complete second Venezuelan site
** To be transferred from DOD Counternarcotics Account

(U) Military Construction: Not Applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Host Nation Agreements being pursued in connection with each planned CBRN site.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102411F
PE Title: Surveillance Radar Stations/Sites
Project Number: 2980
Budget Activity: # 3 - Strategic Systems

A. (U) RESOURCES ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
North Atlantic Defense System (NADS)	4,932	6,518	11,779	7,475	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
Provides 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
Supports US Commander-in-Chief Atlantic (USCINCLANT) and the North Atlantic Treaty Organization (NATO) Supreme Allied Commander Atlantic (SACLANT).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1990 Accomplishments:
- (U) NATO NADS Control and Reporting Center/Communications contract was awarded using NATO Infrastructure Funds
- (U) DT&E started on NATO Radar system
- (U) AWACS connectivity expanded with upgraded UHF ground links

(U) FY 1991 Planned Program:
- (U) First NATO Radar installed in Iceland
- (U) Command and Reporting Center (CRC)/Comm development continues
- (U) Activate AWACS expanded connectivity via HF data link
- (U) Integrate final software release for AWACS connectivity

(U) FY 1992 Planned Program:
- (U) Install and integrate NATO Radars in Iceland
- (U) NATO CRC/Comm development continues
- (U) Conduct System Testing on NATO Radars in Iceland
- (U) FY92 PB request higher than FY91 due to requirement to fund remote rekeying system to enable unattended operation of remote sites. This effort jointly funded by AF and NSA.

(U) FY 1993 Planned Program:
- (U) NATO CRC/Comm development continues
- (U) Develop CONUS software support facility

(U) Program to Completion:
- (U) NATO IADS Full Operational Capability (FOC) achieved when CRC declared operational in
- (U) This is a continuing program

Program Element: #0102411F | Project Number: 2980
PE Title: Surveillance Radar Stations/Sites | Budget Activity: # 3 - Strategic Systems

D. (U) WORK PERFORMED BY: Efforts are managed by the Electronic Systems Division, Hanscom AFB, MA. Technical support is provided by MITRE Corporation, Burlington, MA; Rome Air Development Center, Griffiss AFB, NY; and the Electromagnetic Compatibility Analysis Center, Annapolis, MD. General Electric Radar Systems Division, Syracuse, NY, is the contractor for the NADS NATO Radar Subsystem. Hughes Aircraft & Company, Fullerton, CA, is the contractor for the CRC/Communication subsystem.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: No change
2. (U) SCHEDULE CHANGES: No change
3. (U) COST CHANGES: No change

F. (U) PROGRAM DOCUMENTATION:
- (U) TAC/ADCOM SON 02-80, dated 27 Sep 80
- (U) CINCLANT ROC 3-81, revised 15 Sep 82
- (U) SOC, dated Oct 87
- (U) PMD 4023(4), dated 8 Mar 89
- (U) TEMP, dated 1 Nov 89

G. (U) RELATED ACTIVITIES:
- (U) Program Element #0102412F, DEW Radar Stations
- (U) Program Element #0102417F, Over-the-Horizon Backscatter (OTH-B) Radar
- (U) Program Element #0102325F, Joint Surveillance System,
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

(U) Other Procurement (BA 63):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	0	0	5,118	510	Cont	TBD

(U) Military Construction: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: NADS is a NATO Infrastructure Program funded primarily with NATO funds. The cost sharing relationship is nominally 15/85 with U.S. paying roughly 15% of total costs.

J. (U) MILESTONE SCHEDULE:
1. (U) Iceland NATO Radar (INR) Start FY 1987
2. (U) NATO Control and Reporting Center (CRC) Start FY 1990
3. (U) INR Initial Operational Capability
4. (U) NATO CRC Full Operational Capability

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102412F
PE Title: DEW Radar Stations

Budget Activity: #3-Strategic Programs

A. (U) Resources ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2710 North Warning System	0	1,023	2,862	2,838	18,725	154,523

B. (U) BRIEF DESCRIPTION OF ELEMENT: This PE supports the operation of 20 remaining DEW Line radar stations and funds the North Warning System (NWS) (DEW Line replacement program). The DEW Line provides tactical warning of bomber or cruise missile attack against the North American Continent through a radar 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 DEW Line can be underflown by threat bombers because of numerous gaps at low altitude and marginal radar performance. Because of its age (1957 initial deployment), the DEW Line system is increasingly difficult and costly to operate and maintain. NWS program objectives are to eliminate low-altitude coverage gaps, improve radar performance, and reduce operation and maintenance costs.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project Number and Title: 2710 North Warning System (NWS):
A combination of minimally-attended, long-range radars (LRR) and short-range unattended radars (UAR) will be deployed. This network of radars will provide tactical warning/attack assessment for northern air attack approaches to North America.

(U) FY 1990 Accomplishments:
- (U) No RDT&E Funds were requested
- (U) Complete UAR DT&E

(U) FY 1991 Planned Program:
- (U) Award production contract for UAR program.
- (U) Install LRR at BAR-M Alaska

(U) FY 1992 Planned Program:
- (U) Support site integration for Canadian UAR systems

Program Element: #0102412F
PE Title: DEW Radar Stations

Budget Activity: #3-Strategic Programs

(U) FY 1993 Planned Program:
- (U) Support site integration for Canadian and Alaskan UAR systems

(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; Analytical Systems Engineering Corporation, Burlington, MA; Earth Technology Corporation, Seattle, WA; and the Electromagnetic Compatibility Analysis Center, Annapolis, MD are providing technical support. AN/FPS-117 long-range radars were procured from General Electric Company, Syracuse, NY, in FY 1984 and FY 1985. UNISYS Corporation (formerly Sperry), Great Neck, NY, was selected in FY 1984 as the Full Scale Development contractor for the UAR and overall systems engineering. Canadian NWS efforts are managed by a Canadian program office located in Ottawa.

(U) Related Activities:
- (U) Program Element #0102411F, Surveillance Radar Stations/Sites
- (U) Program Element #0102325F, Joint Surveillance System
- (U) Program Element #0102417F, Over-the-Horizon Backscatter (OTH-B) Radar
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):

(U) Other Procurement (BA 63):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	184,047	6,729	9,233	0	0	478,425
Quantities						
SRR Controllers	2	0	0	0	0	3
Short Range Radar	20	0	0	0	0	37

(U) Military Construction: Not Applicable.

(U) International Cooperative Agreements: The North Warning Program is the key element of North American Air Defense Modernization established by the March 1985 Memorandum of Understanding between the United States and Canada, signed by Secretary of Defense Weinberger and Canadian Minister of Defense Nielson. The NAADM MOU established a cost sharing relationship of 60/40, with Canada responsible for 40% of total costs.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102417F
PE Title: Over-the-Horizon Backscatter (OTH-B)
Project Number: N/A
Budget Activity: #3-Strategic Programs

A. (U) Resources ($ in Thousands)

Project Title / Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
OTH-B	20,052	9,772	7,961	4,013	2,000	431,500

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program develops an Over-the-Horizon Backscatter (OTH-B) radar to satisfy requirements for tactical early warning of an attack on North America by bombers and air-to-surface missiles. The OTH-B will detect and track airborne vehicles at all altitudes to ranges between 500 and 1800 nautical miles. The radar system will provide surveillance coverage of the east and west approaches to North America.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

(U) Over-the-Horizon Backscatter Radar: The OTH-B radar improves CINCNORAD's ability to provide attack assessment of hostile atmospheric threats approaching North America.

(U) FY 1990 Accomplishments:
- (U) Complete DT&E on the East Coast Radar System (ECRS)
- (U) Conduct IOT&E on the ECRS

(U) FY 1991 Planned Program:
- (U) Complete IOT&E for ECRS
- (U) Conduct qualification verification on West Coast Radar System (WCRS)

(U) FY 1992 Planned Program:
- (U) Transfer management responsibility of ECRS and WCRS to AFLC
- (U) Place ECRS and WCRS into stand down caretaker status
- (U) Complete termination activity for Alaska Radar System

(U) FY 1993 Planned Program:
- (U) Complete caretaker contract and PMRT residual actions

(U) Program to Completion:
- (U) Refine ionospheric/performance prediction model.
- (U) Support international cooperative IR&D with Australia on OTH technology.

Program Element: #0102417F
PE Title: Over-the-Horizon Backscatter (OTH-B)
Project Number: N/A
Budget Activity: #3-Strategic Programs

(U) Work Performed By: The development of the OTH-B radar system and supporting OTH-B technical efforts are managed by the Air Force Systems Command's Electronic Systems Division, Hanscom AFB, MA. The radar prime contractor is the General Electric Co., Syracuse, NY. Major subcontractors include General Telephone and Electronics Corp, Waltham, MA; General Electric Co., Huntsville, AL; Continental Electronics, Dallas, TX; and TRW, Redondo Beach, CA. Continuing OTH technical efforts, analysis, engineering studies and support are provided by: Rome Air Development Center, Griffiss AFB, NY; SRI International Remote Measurement Laboratory, Menlo Park, CA; Naval Research Laboratory, Washington, D.C.; MITRE Corporation, Bedford, MA; and the Air Force Geophysics Laboratory, Hanscom AFB, MA.

(U) Related Activities:

- (U) OTH-B will be compatible with related programs such as the North Warning System (PE0102412F) and the Joint Surveillance Sytem (PE0102325F).
- (U) OTH-B will send track information to the Regional and Sector Operations Control Centers of the Joint Surveillance system and to the North American Aerospace Defense Command (NORAD) Cheyenne Mountain Complex.
- (U) Communications will be provided under OTH Radar systems Communications (PE0102444F).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands)

(U) Other Procurement (BA 63):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	186,404	68	0	0	0	1,396,338
Quantity	0	0	0			6
(60 deg sector)						
(U) MILCON	0	11,000	0			71,800

(U) International Cooperative Agreements: None

FY 1992/1993 BIENNIAL BUDGET RDT&E SUMMARY SHEET

Program Element: #0102423F
PE Title: Ballistic Missile Early Warning System (BMEWS)

Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
BMEWS	13,308	17,801	17,887	7,263	Cont.	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The mission of BMEWS is to detect and provide warning of a ballistic missile attack on the United States, Canada, the United Kingdom, and Europe. BMEWS consists of three sites at Thule, Greenland; Clear, Alaska; and Fylingdales, England. The Thule site has been upgraded with a modern phased array radar and computer resources to improve its capability and maintainability. Development funding will upgrade the Fylingdales site as Thule has been. Facility constuction is funded by the United Kingdom (UK). Current capabilities are:

	Thule	Clear/Fylingdales
Range/Warning Time		
Traffic Handling		
Launch Location (CEP)		
Impact Location (CEP)		

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Continued development for BMEWS modernization at the Fylingdales, U.K. site. Completed Critical Design Reviews.
   - (U) Continued software coding and began initial development software testing.
   - (U) Continued hardware testing and began in-plant testing at the system level.
   - (U) Continued facility construction (U.K. funded).

2. (U) FY 1991 Planned Program:
   - (U) Complete in-plant development testing at the system level.
   - (U) Complete facility construction.
   - (U) Accomplish computer and radar installation on-site.
   - (U) Initiate integration testing of on-site equipment and facilities.

Program Element: #0102423F Budget Activity: #3 - Strategic Programs
PE Title: Ballistic Missile Early Warning System (BMEWS)

3. (U) FY 1992 Planned Program:
   - (U) Complete integration testing of on-site equipment and facilities.
   - (U) Achieve Initial Operational Capability (IOC) of Fylingdales, U.K. site.

4. (U) FY 1993 Planned Program:
   - (U) Complete removal of hardware from old site.
   - (U) Continue system engineering to resolve system anomalies identified in testing.

5. (U) Program to Completion:
   - (U) This is a continuing program.
   - (U) Resolve system anomalies identified in system testing.

D. (U) WORK PERFORMED BY: The prime contractor is Raytheon Corporation in Wayland, MA. Major subcontractor is Control Data Corporation in Minneapolis, MN (computers). The program office is located at Air Force Systems Command's Electronic Systems Division, Hanscom AFB, MA. General system engineering is performed by the MITRE Corporation, Bedford, MA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) AFSPACECOM SON 02-87, BMEWS Modernization (S/NF), 8 Apr 88 Joint Program Management Plan, July 1988.
- (U) System Segment Specification for BMEWS Modernization of Site III Fylingdales, U.K., Volumes 1 and 2, ESD/BMEWS/3001A, 2 Nov 87

G. (U) RELATED ACTIVITIES:
- (U) Program Element #0102432F (Sea Launched Ballistic Missile (SLBM) Radar Warning Systems).
- (U) Program Element #0102424F (Spacetrack).
- (U) Program Element #0303110F/0303605F (Defense Satellite Communications System/Satellite Communications Terminals)
- (U) Program Element #0102310F/0102313F (Cheyenne Mountain Upgrade Programs/Integrated TW/AA System)
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

Program Element: #0102423F Budget Activity: #3 - Strategic Programs
PE Title: Ballistic Missile Early Warning System (BMEWS)

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

(U) Procurement (BA #3):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	TO COMPLETE	Total Program
Cost	7,924	336	0	0	Cont	TBD

(U) Military Construction: Not Applicable (funds provided by United Kingdom (UK))

I. (U) International Cooperative Agreements: MOU between the United States and United Kingdom concerning the Modernization of the Ballistic Missile Early Warning Station, Royal Air Force Fylingdales, Yorkshire, United Kingdom, 13 Oct 86 (U). Letter of Offer and Acceptance between the United States Department of Defense and the Government of the United Kingdom, Defense Procurement Office, 8 May 88 (U).

J. (U) MILESTONE SCHEDULE:

1. (U) Contact award	Jun 88
2. (U) Preliminary Design Reviews (PDR) complete	Nov 88
3. (U) Critical Design Reviews (CDR) complete	Aug 89
4. (U) Start string tests	Mar 90
5. (U) System Integration Complete	2nd Qtr 91
6. (U) Initial Operational Capability (IOC)	4th Qtr 92

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102424F Budget Activity: #3-Strategic Programs
PE Title: SPACETRACK

A. (U) Resources ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2295 Space Surveillance Network Improvement Program	1,100	2,000	3,400	24,651	Cont	TBD
2296 Space Surveillance Systems Development	5,600	400	1,225	4,916	Cont	TBD
3202 Air Force Maui Optical Station	3,800	18,337	3,999	4,400	Cont	TBD
3887 Space Control Support	6,000	3,700	11,500	21,500	Cont	TBD
Total	16,500	24,437	20,124	55,467	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: SPACETRACK is a worldwide space surveillance network (SSN) of dedicated, collateral, and contributing electro-optical and radar sensors tasked to provide space object cataloging, surveillance, and warning of potential hostile space events. Increasing satellite populations have saturated the capabilities of some sensors.
use of different launch trajectories, increasing orbital debris population, and geosynchronous orbital altitudes necessitate upgrades to selected detection and tracking sensors. SPACETRACK is the only system that can provide the information necessary for targeting, threat, mission, damage and strike , Current capabilities are limited and the network requires modest enhancements to ensure adequate surveillance and tracking. The Advanced Electro-optical System, a new 4 meter class telescope upgrade for the Air Force Maui Optical (AMOS), will be initiated.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 and FY 1993:

1. (U) Project 2296 Space Surveillance Systems Development:
Provides the architecture, technology, integration and implementation programs for development of sensors for the SSN as well as the associated command, control, communication and mission operations segments. Includes Space Based Visible (SBV) data integration effort.

(U) FY 1990 Accomplishments:
- (U) Began work to integrate data from space-based visible sensors into surveillance system data processing flow.
- (U) Completed DT&E and IOT&E for the Saipan Radar.

Program Element: #0102424F Budget Activity: #3-Strategic Programs
PE Title: SPACETRACK

(U) FY 1991 Planned Program:
- (U) Continue planning and preliminary design for the integration of data from space-based visible sensors into surveillance system data processing flow.

(U) FY 1992 Planned Program:
- (U) Increased funding required to begin hardware and software developments to integrate data from space-based visible sensors into surveillance system data processing flow.

(U) FY 1993 Planned Program:
- (U) Increased funding required to complete ground processing system modifications to integrate data from space-based visible sensor on Midcourse Sensor Experiment (MSX) prior to 1QFY94 flight.

(U) Work Performed By: Space Systems Division, Los Angeles AFB, CA. Space-based visible sensor work is performed by Massachusetts Institute of Technology/Lincoln Laboratory (MIT/LL). General systems engineering and technical support is provided by Aerospace Corporation, Los Angeles, CA.

(U) Related Activities:
- (U) Program Element #0603438F, Satellite System Survivability
- (U) Program Element #0102310F, Cheyenne Mountain Complex Tactical Warning/Attack Assessment System.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):

(U) Other Procurement (BA 63 P-119):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	5,848	0	1,802	2,175	Cont	TBD

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3202 Air Force Maui Optical Station: The Air Force Maui Optical Station (AMOS) is a unique national resource R&D facility that provides measurement support to government and scientific communities, serves as a test bed for electro-optics technology, and supports operational space surveillance requirements. The basic operations and maintenance support is provided through SPACETRACK RDT&E funding. Outside user support is provided through other development, measurement and experimental programs from various outside users (i.e. SDI, Intel, etc.). This site provides critical operational data to Space Command with IR signature data and compensated imaging data used for space object identification and mission/payload assessment (SOI/MPA), space debris measurements, and ASAT support that is unavailable at any other DoD site.

Program Element: #0102424F
PE Title: SPACETRACK

Project: #2295
Budget Activity: #3-Strategic Programs

- (U) Initiates Deep Space Optical Network improvement effort to improve existing GEODSS hardware and software to increase tracking capabilities and accuracy.
- (U) Initiates Uncorrelated Target (UCT) effort to improve target correlation between SSN sites.

3. (U) FY 1992 Planned Program:
   - (U) Completes GEODSS alternatives development.
   - (U) Continues operation of GEODSS ETS.
   - (U) Continues SSNIP system engineering effort.
   - (U) Continue evaluation of proposed improvements to meet space surveillance requirements.
   - (U) Continues orbital debris measurement effort.
   - (U) Initiates star catalog improvement effort to improve sensor measurement accuracy.
   - (U) Completes preliminary analyses of the Deep Space Optical Network and Uncorrelated Target (UCT) improvements. Requires ramp up from FY91 requirement to begin design and development of these tasks.

4. (U) FY 1993 Planned Program:
   - (U) Large ramp from FY92 required for hardware and software builds supporting the ongoing upgrade efforts, as well as a large analytical task associated with the orbital debris program.
   - (U) Continues operation of GEODSS ETS.
   - (U) Continues SSNIP system engineering effort.
   - (U) Continue evaluation of proposed improvements to meet space surveillance requirements.
   - (U) Initiates design and development for a Pirinclik signal processor upgrade.
   - (U) Completes orbital debris measurement program and provides analyses of existing SSN capability to track and predict the orbital debris environment both from normal space operations and ASAT engagements. Orbital debris effects on early warning radars will be evaluated as well. Fixes, if required, will be recommended.
   - (U) Continues star catalog improvement effort.
   - (U) Continues design and development and initiates system integration and testing of the Deep Space Optical Network and Uncorrelated Target (UCT) upgrades.

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

D. (U) Work Performed By: Electronic Systems Division, Hanscom AFB, MA. Prime civilian contractors are TRW, Redondo Beach, CA, SAIC, Torrence, CA, and Rockwell Power Systems, Albuquerque, NM. Systems engineering and technical support is provided by Lincoln Laboratory, Lexington, MA, Mitre Corp, Bedford, MA, CTA, Bedford, MA, ARE, Bedford, MA, and Aerospace Corp, El Segundo, CA. Saipan Radar deployment contracted through Eastern Space and Missile Center (ESMC) and Western Space and Missile Center (WSMC).

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102424F
PE Title: SPACETRACK
Project: #2295
Budget Activity: #3-Strategic Programs

A. (U) Resources ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Space Surveillance Network Improvement Program	1,100	2,000	3,400	24,651	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
Space surveillance assets are required in support of the Space Defense missions of weapons support, attack warning of U.S. satellites, maintenance of space order of battle, and identification/assessment of space objects. The Space Surveillance Network Improvement Program (SSNIP) involves the development and implementation of upgrades to the Space Surveillance Network (SSN) in support of these missions. The SSN is the only system that provides information necessary for assessment, warning and verification of events in space. SSNIP consists of efforts including the Ground-based Electro-Optical Deep Space Surveillance System (GEODSS), Space Defense Command and Control System (SPADCCS), Uncorrelated Target (UCT) elimination, orbital debris measurement, network upgrades, and SSN architecture system developments and deployments.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments
   - (U) Continued "caretaker-only" status of the GEODSS Test Site (GTS) which houses the equipment to be delivered to the 5th GEODSS site. Evaluated potential system enhancements in an operational environment.
   - (U) Continued support of the GEODSS Experimental Test Site (ETS) which provides a technology test bed where potential improvements can be developed and operationally configured before deployment.
   - (U) Completed initial Integrated Network Tasking and Control System (INTACS) technology transfer into Space Defense Operations Center (SPADOC).
   - (U) Continued Space Defense Command and Control System (SPADCCS) systems engineering, analysis, and documentation.

2. (U) FY 1991 Planned Program:
   - (U) Transfer SSN analyses, developments and upgrades previously programmed in Project 3887, Space Control Support, that are required whether or not a U.S. ASAT system is developed.
   - (U) Continues "caretaker-only" status of the GEODSS Test Site (GTS).
   - (U) Continues operation of GEODSS ETS.
   - (U) Initiates SSNIP system engineering effort to establish SSN technical baseline.
   - (U) Continues (SPADCCS) systems engineering, analysis, and documentation.
   - (U) Evaluate proposed improvements to meet space surveillance requirements.
   - (U) Initiates orbital debris measurement effort to characterize the space debris environment of selected DOD orbits.

Program Element: #0102424F Budget Activity: #3-Strategic Programs
PE Title: SPACETRACK

The Advanced Electro-Optical System (AEOS) program will be initiated per Congressional direction in FY91. The FY91 appropriation funds the FY91 and FY92 requirements for AEOS. Additional funds required to complete AEOS are not programmed.

(U) FY 1990 Accomplishments:
- (U) Provided basic core funding for minimum site operations.
- (U) Developed and installed improved infrared sensor which now supports operational tasking.
- (U) Delivered SOI/MPA software and documentation for optical data in support of Cheyenne Mountain.
- (U) Integrated optical and radar SOI/MPA software in support of Cheyenne Mountain.
- (U) Delivered special data reports on objects of high interest in support of Space Command/J2.

(U) FY 1991 Planned Program:
- (U) Provides basic core funding for minimum site operations.
- (U) Available as contributing sensor to Space Surveillance Network (SSN).
- (U) Provides R&D test bed for future operational sensors and SOI/MPA workstation.
- (U) Initiates the Advanced Electro-Optical System (AEOS) upgrade.

(U) FY 1992 Planned Program:
- (U) Provides basic core funding for minimum site operations.
- (U) Provides R&D test bed for future operational sensors.
- (U) Performs experiments with speckle imaging.
- (U) Continue AEOS upgrade effort (no FY92 funds required).

(U) FY 1993 Planned Program:
- (U) Provides basic core funding for minimum site operations.
- (U) Provides for development of electro-optical sensor upgrades to existing facility.
- (U) No funding is included for continue AEOS.

(U) Work Performed By: Rockwell Power Systems, Albuquerque, NM, operates the Maui Optical Tracking and Identification Facility and conducts research and development at the Air Force Maui Optical Site. General systems engineering and technical support is provided by Lincoln Laboratory, Lexington, MA and Mitre Corporation, Bedford, MA.

(U) Related Activities:
- (U) Program Element #0603438F, Satellite System Survivability
- (U) Program Element #0102311F, Cheyenne Mountain Complex Tactical Warning/Attack Assessment System.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):
(U) Other Procurement: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0102424F
PE Title: SPACETRACK

Project: #2295
Budget Activity: #3-Strategic Programs

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Transferred SSN analyses, developments and upgrades previously programmed in Project 3887, Space Control Support, that are required whether or not a U.S. ASAT system is developed.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

(U) ASD/C3I Letter, Space Defense Operations Center, Mar 79 (SECRET).
(U) AFSPACECOM SON 3-79, 30 NOV 1979 (SECRET).
(U) Air Force Space Surveillance Architecture, Jun 83 (SECRET).
(U) Air Force Space Systems Architecture, Jan 85 (SECRET).
(U) Space Surveillance Deficiencies (U), Feb 87 (SECRET).
(U) Memorandum of Agreement between AFLC, AFSPACECOM, and AFSC for the Joint Support of Space & Warning Systems (Sep 87).
(U) Space Surveillance Network Tactical Requirements (U), Jan 88 (SECRET).
(U) USSPACECOM MROC for a Space Control Anti-Satellite Capability, 5 Feb 88 (SECRET).
(U) MNS Space Control Anti-Satellite Capability, 19 May 88 (SECRET).
(U) Space Surveillance Architecture Update (U), Oct 88 (SECRET).
(U) Integrated TW/AA PMD No. 1044(5)/12313F/12310F, 28 Mar 89 as amended.
(U) Space Defense Anti-Satellite (ASAT) Program, PMD No. 4068(29)/64406F,12450F,12424F, 9 Aug 89.
(U) AFSPACECOM SON 02-88 Space Surveillance, 22 Sept 89 (SECRET).
(U) Cheyenne Mountain Upgrade Programs PMD No. 9247(2)/010231F, 6 Jul 90.
(U) AFSPACECOM SON 014-89, Space Object Identification (SOI) Upgrade, Draft, 7 Aug 90 (SECRET).
(U) USSPACECOM MNS 89-001, Dedicated Satellite Radar Imaging Capability, (SECRET).

G. (U) Related Activities:

(U) Program Element #0102310F, Cheyenne Mountain Complex Tactical Warning/Attack Assessment System
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
(U) The Joint Potential Designator (JPD): N/A

H. (U) Other Appropriation Funds ($ in Thousands):

(U) Procurement (BA 63 P-119):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	0.596	0	0.633	0.657	Cont	TBD

I. (U) International Cooperative Agreements: None.

J. (U) MILESTONE SCHEDULE: N/A

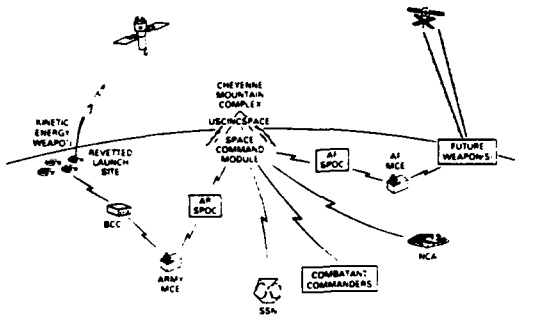
FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102424F
PE Title: SPACETRACK

Project: #3887
Budget Activity: #3-Strategic Programs

Project Title: Space Control Support

ASAT BM/C³



Popular Name: ASAT BM/C3

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	TO COMPLETE
Major Contract	0	0	8,400	14,800	(FY 94-97) TBD
Support Contract	3,964	3,040	1,400	3,900	(FY 94-97) TBD
In-House Support	873	500	800	1,000	(FY 94-97) TBD
GFE/Other	1,163	160	900	1,800	(FY 94-97) TBD
Total	6,000	3,700	11,500	21,500	(FY 94-97) TBD
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	TO COMPLETE
Program Milestones	MS I Jan 90	N/A	PDR 4Q 92	N/A	MS II 2Q FY 94 MS IIIa1 3Q97 MS IIIa2 4Q99 MS IIIb 4Q00
Engineering Milestones	N/A	N/A	N/A	N/A	CDR 1Q95 Hardware Delivery 4Q98

Program Element: #0102424F
PE Title: SPACETRACK

Project: #3887
Budget Activity: #3-Strategic Programs

SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	TO COMPLETE
T&E Milestones	N/A	N/A	N/A	N/A	DT&E/IOT&E 2Q99 Sys End-to End Test 2Q99
Contract Milestones	N/A	Release RFP 3Q FY91	Contract Award 1Q FY92	N/A	Contract Completion 4Q00

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Soviet space systems represent a growing threat to US land, naval, and aerospace forces, enabling over-the-horizon targeting of these forces. This, combined with the operational capability of the Soviet coorbital ASAT, which can attack all US space systems in low earth orbit (LEO), allows Soviet space forces to serve as an unacceptable multiplier for Soviet terrestrial forces. Without a comparable capability, the US would be in an inferior position in any confrontation throughout the spectrum of conflict. This situation could force the US to accept the control of space by the Soviets and provide them the margin of capability needed to defeat US forces. To prevent this, the planned US ASAT system will deploy both kinetic energy and directed energy weapons under the control of a single comprehensive surveillance and battle management/command, control, and communication (BM/C3) system. The ASAT system could also be used against other space threats which may emerge in the future as other countries develop additional space capabilities. This project develops the necessary surveillance and BM/C3 capabilities to provide a highly responsive and flexible control system for all ASAT weapons. The program will improve the Space Surveillance Network (SSN), develop and install BM/C3 sytems in Cheyenne Mountain, and integrate the various ASAT weapons with USCINCSPACE's other space control capabilities.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Began prototyping effort on BM/C3 acquisition
   - (U) Initiated simulation laboratory at AFSPACECOM
   - (U) Prepared source selection and Request for Proposal (RFP) documentation
   - (U) Performed engineering analyses to support system specification
   - (U) Initiated space surveillance upgrade definition contract
   - (U) Began Hypervelocity Breakup Modelling study to analyze ASAT debris hazard

2. (U) FY 1991 Planned Program:
   - (U) Restructure AF BM/C3 and Surveillance program to remain integrated with the Army's Kinetic Energy ASAT weapon program.
   - (U) Develop BM/C3 system concepts and plan system integration activities
   - (U) Continue simulation and prototyping work
   - (U) Begin system engineering effort for overall ASAT system
   - (U) Initiate the ASAT System Concept Definition

Program Element: #0102424F
PE Title: SPACETRACK
Project: #3887
Budget Activity: #3-Strategic Programs

3. (U) FY 1992 Planned Program:
   - (U) Ramp from FY91 required to award ASAT BM/C3 contract
   - (U) Continue simulation work
   - (U) Complete in-house prototyping work
   - (U) Initiate development of BM/C3 software and continue system integration activities
   - (U) Initiate preliminary design of the BM/C3 system

4. (U) FY 1993 Planned Program:
   - (U) Continue simulation work
   - (U) Continue development of BM/C3 software and system integration
   - (U) Complete preliminary design of the BM/C3 system

5. (U) Program to Completion:
   - (U) Installation of ASAT BM/C3 system in Cheyenne Mountain (TBD)

D. (U) WORK PERFORMED BY: No contracts have been awarded to date. Government support is currently provided by MITRE Corp, Lexington, MA. Responsible agency is Air Force Systems Command's Electronic Systems Divi ion.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: Because of the Army KE ASAT program restructure, the Air Force will rephase its program to align with the Army's new schedule. The Army has not yet fully redefined program milestones.

3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:
   - (U) Mission Need Statement (MNS) for Space Control Anti-Satellite Capability, 19 May 1988, SECRET
   - (U) Acquisition Decision Memorandum (ADM), Anti-Satellite (ASAT) Systems, 6 Mar 89, SECRET
   - (U) AFSPACECOM Statement of Operational Need (SON) 003-89, ASAT Battle Management/Command, Control, and Communication (BM/C3) System (draft), 9 May 1989, SECRET
   - (U) AFSPACECOM SON 004-89, ASAT Weapons Systems (draft), 9 May 89, SECRET
   - (U) AFSPACECOM System Operational Requirement Document (SORD) 003-89-1, ASAT BM/C3 and Surveillance System (draft), 22 Nov 89, SECRET
   - (U) USSPACECOM Multicommand Required Operational Capability (MROC) 03-87 for a Space Control ASAT Capability, Joint Chiefs of Staff, SM-77-88, 5 Feb 88, SECRET
   - (U) Acquisition Decision Memorandum for Kinetic Energy Anti-Satellite (KE ASAT) Milestone I Review, 16 Feb 90, UNCLASSIFIED
   - (U) Acquisition Decision Memorandum for Kinetic Energy Anti-Satellite (KE ASAT) Concept Definition Selection, UNCLASSIFIED
   - (U) AFSARC Implementor, Anti-Satellite (ASAT) Battle Management/Command, Control, and Communication (BM/C3) and Space Surveillance Program AFSARC Milestone I, 9 Feb 90, UNCLASSIFIED

Program Element: #0102424F
PE Title: SPACETRACK
Project: #3887
Budget Activity: #3-Strategic Programs

G. (U) RELATED ACTIVITIES:
- (U) Program Element #0102311F, Cheyenne Mountain Complex Tactical Warning/Attack Assessment System.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) JPD to be determined at Milestone II.

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

1. (U) PROCUREMENT: Not applicable.

2. (U) MILITARY CONSTRUCTION: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
None.		

T&E ACTIVITY (TO COMPLETION)

Event	Planned Date	Remarks
DT&E/IOT&E	2Q99	Combined Testing
SYS END-TO-END TEST	2Q99	Demonstrates integrated system (surveillance/BM/C3/weapon) performance

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102431F
PE Title: Defense Support Program

Project: # 3624
Budget Activity: #3 - Strategic Programs

Project Title: Defense Support Program



POPULAR NAME: DSP

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Major Contract	76,036	242,835	10,337	107,585	TBD
Support Contract	8,025	15,667	3,712	2,913	TBD
In-House Support	2,648	5,439	3,414	4,564	TBD
GFE/ Other	3,028	9,736	1,960	7,372	TBD
Total	89,737	273,677	19,423	122,434	TBD
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones					Transition to Follow-on System
Engineerng Milestones	Sat.Readout Sta.Upgrade PDR	Sat.Readout Sta.Upgrade CDR			Continuing
T&E Milestones	MGT-14 DT&E	MGT-14 OT&E	System 1 Software DT&E	System 1 Software OT&E	
Contract Milestones		Sat 16-19 Delivery	Sat 20-22 Delivery		Sat 23-26 Delivery

Program Element: #0102431F
PE Title: Defense Support Program
Project: # 3624
Budget Activity: #3 - Strategic Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The DSP system provides a highly available, reliable spaced-based surveillance system to detect and report missile and space launches and nuclear detonations in near real time
The DSP system consists of
in geostationary orbits, fixed and mobile ground processing stations, one multi-purpose facility, and a ground communications network (GCN). DSP's primary mission is to provide tactical warning and limited attack assessment of a ballistic missile attack.

DSP also detects and reports
nuclear event.
reports infrared, visible and other events for intelligence
This program element provides funding for development to modernize ground stations and integrate satellites to launch vehicles, procurement of satellites and ground station hardware, and operation of the DSP ground stations.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) The European Ground Station (EGS) went operational replacing the unsupportable and less capable Simplified Processing Station.
   - (U) Continued replacement of fixed ground station software architecture to complement DSP-I capabilities (e.g., laser crosslink data processing, processing new sensor data, Ada-based language), and software maintenance and support programs.
   - (U) Continued Mobile Ground System (MGS) hardware and software upgrades to enhance survivability and ensure DSP-I compatibility.
   - (U) Continued the replacement of unsupportable satellite readout equipment at the fixed ground stations. Completed Preliminary Design Reviews.

2. (U) FY 1991 Planned Program:
   - (U) Successfully launched DSP-15 on a Titan IV.
   - (U) Launch DSP-16 from the Space Shuttle, demonstrating dual launch capability and assured access to space.
   - (U) Continue replacement of fixed ground station software.
   - (U) Continue Mobile Ground System (MGS) hardware and software upgrades.
   - (U) Continue the replacement of unsupportable satellite readout equipment at the fixed ground stations.
   - (U) Begin the development to replace overloaded computers at the fixed ground stations.
   - (U) Identify and define engineering improvements to reduce the cost, schedule, and risk, of a DSP follow-on system.

Program Element: #0102431F
PE Title: Defense Support Program
Project: # 3624
Budget Activity: #3 - Strategic Programs

3. (U) FY 1992 Planned Program:
   - (U) Launch DSP-17.
   - (U) Continue the replacement of fixed ground station software.
   - (U) Continue Mobile Ground System (MGS) hardware and software upgrades.
   - (U) Continue the replacement of unsupportable satellite readout equipment at the fixed ground stations.
   - (U) Continue the replacement of overloaded computers at the fixed ground stations.
   - (U) Continue to pursue DSP follow-on improvements.

4. (U) FY 1993 Planned Program:
   - (U) Launch DSP-18, the first DSP satellite with Laser Crosslink.
   - (U) Complete the replacement of fixed ground station software.
   - (U) Complete Mobile Ground System (MGS) hardware and software upgrades.
   - (U) Continue the replacement of unsupportable satellite readout equipment at the fixed ground stations.
   - (U) Complete the replacement of overloaded computers at the fixed ground stations.
   - (U) Begin Ground System Supportability (GSS) project to ensure DSP ground system will meet requirements and last through transition to the follow-on system.
   - (U) Continue to pursue DSP follow-on improvements.

5. (U) Program to Completion:
   - (U) This is a continuing program.
   - (U) Emphasis directed toward eliminating/minimizing operational deficiencies and vulnerabilities, insuring launch capability by either Titan IV or Space Shuttle, insuring a survivable DSP through MGS and satellite upgrades, and insuring ground station data accuracy.
   - (U) Plan and execute the transition to the DSP follow-on system.

D. (U) WORK PERFORMED BY: The Program Executive Officer (PEO) for Space is responsible for system development and acquisition. The major contractors are TRW, Redondo Beach, CA; Aerojet Electronic Systems Division, Azusa, CA; IBM, Boulder, CO; Aerospace Corp., El Segundo, CA; Sandia National Laboratories, Albuquerque, NM; and Los Alamos National Laboratories, Los Alamos, NM.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:
   1. (U) ENGINEERING CHANGES: None.
   2. (U) SCHEDULE CHANGES: None.
   3. (U) COST CHANGES: Funds were added in FY93 and outyears for DSP upgrades and for the procurement of satellites 25 and 26. FY92 DSP RDT&E funds were reduced due to the availability of FY91 Advanced Warning System (AWS) funds. To ensure the executability of DSP in FY92 and to pursue DSP follow-on improvements, FY91 AWS funds were moved to the DSP RDT&E line.

F. (U) PROGRAM DOCUMENTATION:

   - (U) DepSecDef memo for SAF (S), Subject: DSARC I for Advanced Warning

Program Element: #0102431F
PE Title: Defense Support Program

Project: # 3624
Budget Activity: #3 - Strategic Programs

Systems, 15 Feb 80; and SAF/AL memo for USAF/CV (S), Subject: DSP DSARC I Implementation, 3 Mar 80.
- (U) MENS for Improved Missile Warning and Attack Assessment, SecDef memo to SAF (S), 19 Mar 80.
- (U) SON 201-82, Survivable and Enduring Missile Warning System (S), 11 Oct 82.
- (U) DSP System Operational Concept (SOC) (S), 1 Dec 87.

G. (U) RELATED ACTIVITIES:
- (U) Program Elements #0303110F/0303605F (Defense Satellite Communications System/Satellite Communications Terminals)
- (U) Program Elements #0303603F/0303601F (Milstar Space and Mission Control/Milstar AF Terminals)
- (U) Program Elements # 0305144F/0305171F (Titan Space Boosters/Space Launch Support)
- (U) Program Elements #0102310F/0102313F (Cheyenne Mountain Upgrade Programs/Integrated TW/AA System)
- (U) Program Elements #0305110F/0305151F (AF Satellite Control Network)
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Missile Proc (BA 45)						
Cost	345,530	326,246	192,552	464,076	Cont	TBD
Quantity (satellites)	1	1	0	1	Cont	TBD
Other Proc (BA 63)						
Cost	75,487	74,213	58,787	66,648	Cont	TBD

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
Flight 14 on-orbit DT&E/OT&E	FY89	Completed
Flight 15 on-orbit DT&E/OT&E	FY91	Completed
Ground system upgrades for DSP-I satellites DT&E/OT&E	FY88-89	Completed

T&E ACTIVITY (TO COMPLETION)

Event	Planned Date	Remarks
Satellite on-orbit DT&E/OT&E	FY91-01	Satellites 16-26
MGT-14 Upgrade DT&E/OT&E	FY89-93	six mobile term.
System 1 Software DT&E/OT&E	FY89-93	three gnd. sta.
Ground Computer Changeout	FY91-93	three gnd. sta.
Satellite Readout Station Upgrade	FY90-93	three gnd. sta.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102432F
PE Title: Sea Launched Ballistic Missile (SLBM) Radar Warning Systems

Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2877/PAVE PAWS	3,559	2,242	966	1,010	Cont.	34,825

B. (U) BRIEF DESCRIPTION OF ELEMENT: The SLBM Radar Warning System consists of PAVE PAWS sites at Cape Cod AFS, MA; Beale AFB, CA; Robins AFB, GA; and Eldorado AFS, TX; and the Perimeter Acquisition Radar Attack Characterization System (PARCS) in North Dakota.

This program element funds for upgraded Automated Data Processing (ADP) at the older NE and NW sites, enhanced security equipment for all four sites, and an auxiliary tracker at the SE site as interim fix for Electro-Explosive Device (EED) hazard.

C. (U) JUSTIFICATION FOR PROJECT LESS THAN $10 MILLION IN BOTH FY 1992 AND FY 1993:

(U) Project number, Title: Project 2887, PAVE PAWS
The Pave Paws modernization program (ADP upgrade) at the NE and NW sites will enhance their mission capability and accrue life cycle cost savings by providing common equipment at all four sites. An Intrusion Detection Alarm System at all sites will enhance security. SE auxiliary tracker will que the main radar to blank out one face while EED-equipped aircraft approach Robbins AFB.

(U) FY 1990 Accomplishments:
- (U) Continued system engineering software development and in-plant testing for the ADP upgrades (NE and NW sites).
- (U) Began installation/on-site testing of ADP upgrade at NE.
- (U) Awarded contract for Automatic Face Blanking Modification.
- (U) Began development of Intrusion Detection Alarm System (IDAS) at NE, NW, and SE sites.

(U) FY 1991 Planned Program:
- (U) Complete system engineering and software development for ADP upgrades (NE and NW sites) and complete NE installation.
- (U) Develop Automatic Face Blanking Modification for SE site.

Program Element: #0102432F Budget Activity: #3 - Strategic Programs
PE Title: Sea Launched Ballistic Missile (SLBM) Radar Warning Systems

- (U) Initiate on-site installation and testing of NW site ADP.
- (U) Complete development and testing of IDAS at NE and SW sites.

(U) FY 1992 Planned Program:
- (U) Complete on-site installation and testing of NW site ADP.
- (U) Complete IDAS testing at SE and NW sites.
- (U) Complete installation/testing of Automatic Face Blanker

(U) FY 1993 Planned Program:
- (U) Continue system engineering to resolve known and future problems identified in testing and operations.

(U) Work Performed By: The prime contractor is Raytheon Corporation, Wayland, MA. Major subcontractors are Control Data Corporation, Minneapolis, MN (computers), and TRW, Redondo Beach, CA (software). The program office is located at Air Force Systems Command's Electronic Systems Division, Hanscom AFB, MA. General system engineering is performed by the MITRE Corporation, Bedford, MA.

(U) Related Activities:
- (U) Program Element #0102423F (Ballistic Missile Early Warning System).
- (U) Program Element #0102424F (Spacetrack).
- (U) Program Elements #0303110F/0303605F (Defense Satellite Communications System/Satellite Communications Terminals)
- (U) Program Elements #0102310F/0102313F (Cheyenne Mountain Upgrade Programs/Integrated TW/AA System)
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds:

(U) Other Procurement (BA #3):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	746	10	0	1019	Cont.	TBD

(U) Military Construction: Not Applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102433F Project Number: # 0001
PE Title: Integrated Operational NUDET Detection System (IONDS) Budget Activity: #3-Strategic Programs

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY1992 Estimate	FY1993 Estimate	To Complete	Total Program
0001 NUDET Detection System	6,735	23,061	6,873	5,436	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT:
The National Command Authorities require a highly survivable capability to detect, locate, and report any nuclear detonation (NUDET) on a global basis in near real time. NUDET information supports post-impact selection of appropriate retaliatory options in response to a nuclear attack against North America, as well as strike confirmation, and damage assessment. The NUDET Detection System consists of sensors integrated on the operational Navstar Global Positioning System (GPS) satellites plus a user segment consisting of Ground NDS Terminals. The sensors will provide location of nuclear bursts worldwide __

This program element funds development and procurement of the electromagnetic pulse (EMP) sensors and development of the ground terminals. It complements PE 0301357F which provides for the integration of these NDS sensors on GPS spacecraft.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments
   - (U) Took delivery of four Ground/Airborne Integrated Terminals (G/AIT) full scale development (FSD) terminals.
   - (U) Continued integration/testing of FSD G/AIT terminals.
   - (U) Restructured G/AIT program to develop and produce separate ground terminal based on existing Space Command terminal.
   - (U) Continued engineering development and requalification of NDS sensors to install into GPS Block IIR satellites.

2. (U) FY 1991 Planned Program:
   - (U) Initiate design definition of low cost ground NDS terminals.
   - (U) Complete integration/testing of G/AIT terminal. Closeout G/AIT development contract.
   - (U) Develop hardware/software upgrade requirements to use G/AIT FSD terminals on E-4B aircraft.
   - (U) Continue engineering development and requalification of NDS sensors to install into GPS Block IIR satellites.
   - (U) Complete design of NDS electromagnetic pulse sensor.

Program Element: #0102433F Project Number: # 0001
PE Title: IONDS Budget Activity: #3-Strategic Programs

3. (U) FY 1992 Planned Program:
   - (U) Complete design definition of low cost ground NDS terminals.
   - (U) Initiate fabrication of ground terminal prototypes.
   - (U) Complete development and requalification of NDS sensors for Block IIR satellites.
   - (U) Begin development of reprocurement package for ground terminal production program.
   - (U) Begin design to integrate ground terminals in SAC and AFSPACECOM mobile command posts.

4. (U) FY 1993 Planned Program:
   - (U) Deliver two ground terminal prototypes.
   - (U) Complete reprocurement package development for ground terminal production program.
   - (U) Complete integration design for ground terminals in mobile command posts. Fabricate required integration hardware and software.
   - (U) Install and test ground terminals in SAC and AFSPACECOM mobile command posts.

5. (U) Program to Completion:
   - (U) NDS sensor program is a continuing program. Sensors will be developed and procured for all future GPS satellites.

D. (U) WORK PERFORMED BY: System development and procurement is accomplished by Air Force Systems Command's Space Systems Division, Los Angeles AFB, CA with the Rockwell International, Seal Beach, CA, integrates the NDS sensors on Block II GPS satellites and produces the EMP sensor for Block II satellites. General Electric, East Windsor, NJ will integrate NDS sensors on Block II replenishment satellites. Science Applications International Corporation, Manhattan Beach, CA, and the Aerospace Corporation, El Segundo, CA, provide systems engineering support. Sandia National Laboratories, Albuquerque, NM, and Los Alamos National Laboratory, Los Alamos, NM, are under contract to the Department of Energy to produce the X-ray and optical nuclear detonation sensors. Texas Instruments, Dallas, TX, is developing the G/AIT. Sandia National Labs will develop the NDS Ground Terminal prototypes.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Due to increased cost of G/AIT terminals, and the fact that ground terminal requirements are much less stringent than airborne terminal requirements, the Air Force decided to separate the ground and airborne programs in May 1990. Ground terminals will be developed based on the Integrated Correlation and Display System (ICADS) terminals already

Program Element: #0102433F Project Number: # 0001
PE Title: IONDS Budget Activity: #3-Strategic Programs

operational at Space Command. This option will provide the ground terminal users a lower cost terminal that still meets all their requirements. The G/AIT terminals will be upgraded for potential installation on the E-4B NEACP aircraft.

2. (U) SCHEDULE CHANGES: Schedule has been modified to reflect the above restructuring. Ground terminal prototypes will be delivered in FY93 and 94, with production unit deliveries starting in FY95.

3. (U) COST CHANGES: Funds were added to the program in FY92-94 to accomplish the restructured program.

F. (U) PROGRAM DOCUMENTATION:
- (U) SORD, draft 1989.
- (U) PMD 6112(12), 29 March 88

G. (U) RELATED ACTIVITIES:
(U) PE 0305165F, Navstar Global Positioning System (GPS) Space Segment.

(U) PE 0301357F, NUDET Detection System (NDS)
(U) PE 0305999F, Data Analysis.
(U) PE 0302015F, NEACP/E-4B Class V
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H.(U) OTHER APPROPRIATION FUNDS ($ in Thousands)

(U) Missile Procurement (BA 27, P-44/45)

	FY 1990 Actual	FY 1991 Estimate	FY1992 Estimate	FY1993 Estimate	To Complete	Total Program
Cost	0	17,977	32,022	33,959	Cont	TBD
Quantities			4	6	Cont	TBD

(U) Other Procurement (BA 83)

Cost	0	0	0	24	Continuing	TBD

I. (U) International Cooperative Agreements: Not applicable.

J. (U) MILESTONE SCHEDULE:

1. Complete Ground Terminal Prototype Design	Jul 92
2. Begin Ground Terminal Prototype Deliveries	Jul 93
3. Launch first Block IIR satellite with upgraded NDS sensors	1995

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element : #0207129F Budget Activity: #4 - Tactical Programs
PE Title: F-111 Squadrons

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2962 F-111 Avionics Modernization Program (AMP)	12,877	5,277	5,816	2,878	625	131,489
3079 F-111 Digital Flight Control System (DFCS)	14,783	3,988	6,651	296	0	61,559
13323A F-111 Crew Escape Module Parachute Replacement	0	1,950	8,000	0	0	11,387
3924 F-111 SRAM-T Integration	0	0	0	31,361	Cont	TBD
19302B F-111 Stores Management System	0	0	9,600	30,000	0	39,600
	27,660	11,215	30,067	64,535	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program provides funds to develop improved systems not currently in production for the F-111 aircraft. The F-111F and G model aircraft (the G model is an FB-111 converted to a Tactical Air Command trainer) are currently planned to be in service throughout their service life which is approximately 2010.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY1993:

1. (U) Project 2962, Avionics Modernization Program (AMP): The F/FB-111 AMP is a low risk reliability/maintainability upgrade to the bomb navigation system of the FB-111, F-111 A/D/E/F, and EF-111A. This modification involves the substitution, modification and repackaging of 16 Line Replaceable Units in the following subsystems: Inertial Navigation System, Terrain Following Radar, Attack Radar, Doppler Radar, controls and Displays and Data Transfer Unit. The AMP modification also raises the mean time between failure of the overall system from the current five hours to approximately 20 hours and will ensure system supportability through the 1990s. The current phase of development deals with the design of Test Program Sets (TPSs) needed to achieve an organic repair capability at intermediate and depot levels, and independent validation and verification (IV&V) of the Avionic Intermediate Shop Replacement (AIS-R) sets. In early 1988, an agreement was reached between Air Force Systems Command (AFSC) and Air Force Logistics Command (AFLC) specifying that Warner-Robins Air Logistics Center (ALC) would develop the TPSs in-house. This agreement was based on anticipated savings in development costs and an earlier projected fielding date (as compared to contracting the effort with private industry) for the AMP TPSs.

(U) FY 1990 Accomplishments:
- (U) SRU and TPS development efforts continued.
- (U) Preliminary Design Review and Critical Design Review completed for LRU TPS development.

(U) FY 1991 Planned Program:
- (U) Complete SRU TPS development.
- (U) Continue LRU TPS development and begin LRU TPS Independent

Program Element: #0207129F Budget Activity: #4 - Tactical Programs
PE Title: F-111 Squadrons

Validation and Verification (IV&V).
- (U) IV&V for AIS-R.

(U) FY 1992 Planned Program:
- (U) Complete LRU TPS development and IV&V.
- (U) Continue IV&V for AIS-R.

(U) FY 1993 Planned Program:
- (U) Continue IV&V for AIS-R.

(U) Work Performed By: The F-111 AMP contractors are General Dynamics Corporation, Ft. Worth, TX for the FB-111 aircraft; and Grumman Aerospace Corporation, Bethpage, NY for the F-111 A/E and EF-111 aircraft. Development of the TPSs is being performed in-house by Warner-Robins ALC, GA. AIS-R IV&V is being performed by The Analytical Sciences Corporation.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):

(U) Aircraft Procurement (3010) Funds:

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	34,400	0	0	0	0	916,400

(U) International Cooperative Agreements: None.

2. (U) Project 3079, Digital Flight Control System (DFCS): The DFCS is a Class IV-A safety modification that replaces the electronic portion of the F/FB/EF-111 flight control system with a modern state-of-the-art digital computer and sensors. This project will also improve the critical interfaces of the flight control system by incorporating the on-board autopilot and low altitude monitor, and monitoring the terrain following radar systems. As a by-product of this safety modification, the system reliability of the flight control system will be improved from the current 60 hours to 1750 hours.

(U) FY 1990 Accomplishments:
- (U) Completed DT&E/IOT&E on the FB-111A (SAC configuration).
- (U) Continued DT&E/IOT&E on the TAC configured FB-111A (short wing tips).
- (U) Awarded the Low Rate Initial Production (LRIP) option.

(U) FY 1991 Planned Program:
- (U) Deliver six LRIP units for kit-proofing on the six models of F-111 aircraft.
- (U) Complete development of the Maintenance Training Set (MTS).
- (U) Award the first full production option.

(U) FY 1992 Planned Program:
- (U) Program Management Responsibility Transfer (PMRT) to Air Force Logistics Command.
- (U) Complete testing on EF-111A aircraft.
- (U) Award second production option.
- (U) Start installations during programmed depot maintenance.

Program Element: #1207129F Budget Activity: #4 - Tactical Programs
PE Title: F-111 Squadrons

- (U) Award second production option.
- (U) Start installations during programmed depot maintenance.

(U) FY 1993 Planned Program:
- (U) Complete development on TPSs.

(U) Work Performed by: The DFCS contractor is General Dynamics, Ft Worth, TX. The F-111 System Manager is located at Sacramento Air Logistics Center, McClellan AFB, CA. The DFCS development effort is managed at Aeronautical Systems Division, Wright-Patterson AFB, OH.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):

Aircraft Procurement (3010) Funds:

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	2,500	26,600	27,200	0	0	56,300

(U) International Cooperative Agreements: None.

3. (U) Project 13323A, F-111 Crew Excape Module Parachute Replacement: A class IV-A safety modification to replace the current capsule parachute in the F-111 fleet. Approximately 25% of the F-111 ejections since 1976 have resulted in major back injuries (spinal fractures) when their escape module impacts the ground. An even higher percentage of ejections have resulted in less severe back injuries to the crew members. A previous effort in this project was terminated because of insurmountable technical problems during high speed ejections. Since this previous effort was terminated, there have been three ejections in the F-111, all of which resulted in air crew back injuries when the module impacted the ground. The current proposed effort uses a different approach and newer technology to slow down the capsule descent rate and prevent future injuries. Quick Reaction Capability (QRC) or Specialized Management procedures (AFR 57-5 or AFR 800-29, respectively) will be employed (as appropriate) in order to meet the safety install schedule.

(U) FY 1990 Accomplishments: Not applicable.

(U) FY 1991 Planned Program:
- (U) Award contract for development, test, and integration effort.
- (U) Development testing.
- (U) Begin qualification testing.
- (U) Production contract award.

(U) FY 1992 Planned Program:
- (U) Complete qualification testing and installations.

(U) FY 1993 Planned Program: Not applicable.

(U) Work Performed By: TBD (Source selection scheduled for FY 1991).

(U) RELATED ACTIVITIES: There is no unnecessary duplication of

Program Element: #0207129F
PE Title: F-111 Squadrons

Budget Activity: #4 - Tactical Programs

Aircraft Procurement (3010) Funds:

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY1993 Estimate	To Complete	Total Program
Cost	0	9,952	0	0	0	9,952

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element : #0207129F
PE Title: F-111 Squadrons
Project Number: 3924
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
SRAM-T Integration Development	0	0	0	31,361	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Conducts the RDT&E to modify the F-111 aircraft and associated weapon system trainers to employ the Short Range Attack Missile - Tactical (SRAM-T). This includes avionics computer and stores management system software and hardware improvements, modifications to the tactical pylons, flight testing and nuclear certification. SRAM-T is a first generation tactical nuclear air delivered missile capable of penetrating enemy air defenses to strike defended, hard and relocatable targets without having to directly over fly targets.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments: Not applicable.

2. (U) FY 1991 Planned Program: Not applicable.

3. (U) FY 1992 Planned Program: Not applicable.

4. (U) FY 1993 Planned Program:
   - (U) Award contract for integration effort.
   - (U) Develop the software modifications to avionics and stores management systems.
   - (U) Engineer modifications to the tactical pylon for SRAM-T carriage.
   - (U) Begin fabrication and structural tests on modified pylons.
   - (U) Begin fabrication of flight test assets.

5. (U) Program to Completion:
   - (U) Conduct flight test program.
   - (U) Kitproof.
   - (U) Production installation.

D. (U) Work Performed By: TBD (Source selection scheduled for FY 1992).

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: Program slipped one year because of budgetary priorities.
3. (U) COST CHANGES: None, except as associated with schedule change.

F. (U) PROGRAM DOCUMENTATION:

- (U) Program Management Directive 0936(1)/PE 27192, 15 March 90. "Class V Modification to Install Short Range Attack Missile-Tactical (SRAM-T) (AGM-131B) on F-111 Aircraft.

Program Element: #0207129F Project Number: 3924
PE Title: F-111 Squadrons Budget Activity: #4 - Tactical Programs

- (U) TAF 306-86-I-A, System Operational Requirements Document (SORD) for Nuclear Tactical Air to Surface Missile (TASM), 8 Aug 89 (Secret-NF-WN-RD).

G. (U) RELATED ACTIVITIES:

- (U) PE 64244F, SRAM II Program.
- (U) PE 64245F, SRAM-T Program.
- (U) Program Element #27129F, F-111 Squadrons, Stores Management System.
- (U) Joint Modification Strategy Panel met in Oct 90 to determine to what extent SMS will be coordinating with Stores Management System.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

(U) Procurement (3010) Funds:

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY1993 Estimate	To Complete	Total Program
Cost	0	0	0	0	49,400	49,400

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

1.	(U) Contract award	FY 93/2
2.	(U) F-111 test aircraft instrumented	FY 94/4
3.	(U) First Flight	FY 95/2
4.	(U) Kit proof	FY 96/1
5.	(U) First assets delivered	FY 97/1

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element : #0207129F
PE Title: F-111 Squadrons
Project Number: xxxx
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
F-111 Stores Management System (SMS)	0	0	9,600	30,000	0	39,600

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The existing SMS is failure prone and projected to become unsupportable by FY 93. This project will design, fabricate, and test a solid state weapon system controller and cockpit control panel and replace the release programming unit, central programming unit, and cockpit control panel in the F-111F/G. This modification will provide much needed reliability and maintainability improvements, SMS commonality in the F-111 fleet, and permit implementation of MIL STD 1760. This program will increase the F-111 war fighting capability by eliminating inadvertent releases and release failures, and reduce operations and support costs.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments: Not applicable.

2. (U) FY 1991 Accomplishments: Not applicable.

3. (U) FY 1992 Planned Program:
   - (U) Start Full Scale Development.
   - (U) Preliminary software and hardware design.
   - (U) Preliminary Design Review.

4. (U) FY 1993 Planned Program:
   - (U) Critical Design Review.
   - (U) First Article (prototype).
   - (U) Start flight test.

5. (U) Program to Completion:
   - (U) Complete flight test.
   - (U) Kitproof.
   - (U) Production installation complete by FY 2000.

D. (U) Work Performed By: Currently no contractors. Requests for Proposals are currently scheduled to be out in March, 91.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: None
3. (U) COST CHANGES: Funds were moved from appropriation 3010 to 3600 in FY 93 for SMS development. FY 92 and FY 93 funds were changed to account for incorporation of MIL-STD-1760 and newly programmed force structure changes.

F. (U) PROGRAM DOCUMENTATION:

Program Element: #0207129F | Project Number: xxxx
PE Title: F-111 Squadrons | Budget Activity: #4 - Tactical Programs

- (U) Tactical Air Command Configuration Control Board Approval, 11 May 90

G. (U) RELATED ACTIVITIES:

- (U) Program Element #27129F, F-111 Squadrons, Project 3924, SRAM-T.
- (U) Joint Modification Strategy Panel met on 22 Oct 90 at SM-ALC to determine to what extent SMS will be coordinating with SRAM-T.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

(U) Procurement (3010) Funds:

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY1993 Estimate	To Complete	Total Program
Cost	0	0	0	0	81,000	81,000

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

1.	(U) Contract award	Nov 91
2.	(U) Preliminary Design Review	May 92
3.	(U) Critical Design Review	Feb 93
4.	(U) Flight test	Jun 93 - Feb 94
5.	(U) Kitproof	Jun 94 - Dec 94
6.	(U) Production install	Jun 95 - Jan 00

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FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0207131F
PE Title: A-10 Squadrons
Project Number: # N/A
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

A-10 Squadrons

Popular Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
	3,952	0*	12,832	0	0	16,784

* Funding deferred by Congress until decision made on follow-on Close Air Support (CAS) aircraft. This decision was made in the 26 Nov 90 Milestone IV CAS Defense Acquisition Board (DAB). The AF will now initiate reprogramming action while the initial phase of the Improved Data Modem (IDM) program is covered by the Global Positioning System (GPS) program in a joint Contract Engineering Task (CET) covering the Control Display Unit (CDU) which is required by both Mods.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

A majority of A-10s are scheduled for retirement from the tactical fighter force within the next five years. The Air Force plans to retain sufficient aircraft in the inventory to support two wings of A-10s for Close Air Support (CAS) and to upgrade the Forward Air Controller (FAC) force, designated as OA-10s. These A/OA-10s require an Improved Data Modem (IDM) fully compatible with the Automatic Target Handoff System currently in use by the U.S. Army. The development funds support two separate but related efforts. The first is the development of a Class V modification for the installation of the IDM. This kit will be retrofitted to A/OA-10's which will already be equipped with the Low Altitude Safety and Targeting Enhancement (LASTE) system. The second is the A/OA-10 Technology Demonstrator Program (TDP) which integrates/demonstrates avionics technology and different Forward Looking InfraRed (FLIR) systems for use on the future battlefield. The results of the TDP may assist Tactical Air Command in identifying requirements which may lead to future modifications of A/OA-10s.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Initiated TDP demonstration flights using three different FLIRS and an automatic target handoff system.
   - (U) Completed contracted TDP evaluation/industry survey report examining feasibility, potential benefits,and relative costs to incorporate various avionics upgrades
   - (U) Identified additional avionics systems for TDP (options not exercised due to funding constraints)
   - (U) Completed MOA with F-16 SPO to support Improved Data Modem (IDM) development with Naval Research Lab.
   - (U) IDM detailed tasks/schedule and preliminary acquisition planning accomplished.

Program Element: # 0207131F
PE Title: A-10 Squadrons
Project Number: # N/A
Budget Activity: #4 - Tactical Programs

- (U) First Incremental Design Review conducted for IDM Aug 90.
- (U) Obtained Sacramento Air Logistics Center (SM-ALC) Configuration Control Board (CCB) approval for Class V Mod.

2. (U) FY 1991 Planned Program:
   - (U) Second Incremental Design Review on IDM (Oct 90)
   - (U) Complete A/OA-10 TDP demonstration flights (Nov 90)
   - (U) Publish an evaluation report on TDP (Apr 91).
   - (U) Award A/OA-10 IDM Contract Engineering Task (CET) for IDM Integration Phase I (CET Award thru Critical Design Review.)
   - (U) Development contractor will obtain the required CDU.
   - (U) Complete preliminary design(overall system).
   - (U) Complete CDU software requirements.
   - (U) Complete preliminary system software design.
   - (U) Complete Hot Bench Design.
   - (U) Complete software detail design.
   - (U) Complete Critical Design Review (CDR).
   - (U) Receipt of IDM as government furnished equipment (GFE) from F-16 SPO.
   - (U) Receipt of CDU from the development contractor

3. (U) FY 1992 Planned Program:
   - (U) Award A/OA-10 IDM contract engineering task (CET) to contractor for Phase II (CDR thru commencement of dynamic simulation)
   - (U) Complete software code and test
   - (U) Complete hot bench (static testing) integration.
   - (U) Award A/OA-10 IDM CET to contractor for Phase III(commencement of dynamic simulation thru delivery of level III, reprocurement data)
   - (U) Complete dynamic simulation/integration.
   - (U) Complete group A kit development.
   - (U) Complete 2 prototype kits and install (trial)
   - (U) Complete flight testing
   - (U) Receipt of Level III reprocurement data package
   - (U) Complete Independent Verification/Validation (IV&V)
   - (U) Complete preliminary tech orders

4. (U) FY 1993 Planned Program: Not Applicable. Development is complete in FY 92.

5. (U) Program to Completion: Not Applicable

D. (U) WORK PERFORMED BY: A/OA-10 TDP is on contract with Grumman Aerospace, Bethpage NY and managed by Aeronautical Systems Division, Wright-Patterson AFB OH. No contract decisions have been made concerning IDM integration on the A/OA-10 aircraft, but efforts will be managed by Sacramento Air Logistics Center (SM-ALC), McClellan AFB, CA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Addition of the control display unit (CDU) and integration which is also required by the GPS Modification.
2. (U) SCHEDULE CHANGES: Prototype kit availability slips to FY92.

Program Element: # 0207131F
PE Title: A-10 Squadrons
Project Number: # N/A
Budget Activity: #4 - Tactical Programs

3. (U) COST CHANGES: SM-ALC determined that additional RDT&E was required in FY 92 to accomplish development and integration of a Class V mod kit to include the new CDU also required for Global Positioning System (GPS) modification. This was accomplished through a zero-balance transfer between development and modification accounts within the A-10 program. It was also determined that significant cost savings result if the GPS and IDM integration are accomplished concurrently through completion of the production effort. The acquisition and implementation of GPS are managed by a Joint Program Office.

F. (U) PROGRAM DOCUMENTATION:
- (U) Defense Resources Board (DRB) memorandum, 89-18, Tentative Secretary of Defense Decisions on Program Adjustment Issues Discussed with the DRB on April 12, 1989, Close Air Support, 13 Apr 89.(S)
- (U) Program Budget Decision (PBD) no. 993, Close Air Support, 20 Apr 89, (S).
- (U) TAF-304-88 Statement of Operational Need (SON) Short Range Data Communications for Close Air Support and Defense Suppression, HQ TAC/DRCA, 8 Feb 89.(S)
- (U) TAF-304-88-1/11-A, System Operational Requirements Document (SORD) Short Range Data Communication for Close Air Support and Defense Suppression, HQ TAC/DRCA, 12 Jun 90.(S)
- (U) PMD 3034 (50)/0207131F, A/OA-10 Technology Demonstrator Program (TDP), 21 Feb 90.
- (U) Acquisition Decision Memorandum (ADM) for CAS program, 28 Nov 90.

G. (U) RELATED ACTIVITIES:
- (U) P.E. 0207133F, F-16 Squadron
- (U) P.E. 0604249F Night Precision Attack
- (U) P.E. 0305164F Navstar Global Positioning System User Equipment
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands):
(U) Procurement (BA 5):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost*	0	0	0	7,200	49,200	56,400

* (U) Funds shown budgeted beginning in FY 93 support only the A-10 IDM.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE

1.	(U) Received PMD	Jan 90
2.	(U) Coordinated MOA/F-16 SPO	Aug 90
3.	(U) SM-ALC CCB approval	Sep 90
4.	(U) HQ AFLC CCB approval	Oct 90
5.	(U) Award CET (Joint with GPS)	Dec 90
6.	(U) PDR	May 90
7.	(U) Receipt of IDM (GFE)	Sep 91
8.	(U) CDR	Aug 91
9.	(U) Hot bench testing	Feb 92

Program Element: # 0207131F
PE Title: A-10 Squadrons

Project Number: # N/A
Budget Activity: #4 - Tactical Programs

10.	(U) Dynamic simulation/integration	Jun 92
11.	(U) Prototype installation (#1)	Jun 92
12.	(U) QT&E	Oct 92
13.	(U) QOT&E	Mar 93
14.	(U) Trial installation (#2)	Dec 92
15.	(U) Level III data delivery	Mar 93
16.	(U) Contract award (Mod Kits)	Mar 94
17.	(U) First article	Mar 95
18.	(U) Kit proof delivery	May 95
19	(U) Kit proof	Sep 95
20.	(U) Production kit delivery (169 kits)	Jun 96-Jun 97
21.	(U) Production kit installs	Sep 96-Sep 97

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0207133F
PE Title: F-16 Squadrons

Project: # 2671
Budget Activity: #4-Tactical Programs

Project Title: F-16 Squadrons



POPULAR NAME: F-16 Falcon

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousand)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Major Contract	4,544	14,400	162,417	94,007	144,356
Support Contract	965	0	0	0	0
In-House Support	9,704	8,400	8,600	8,800	38,250
GFE/ Other	2,771	2,824	3,811	3,675	15,916
Total	17,984	25,624	174,828	106,483	905,525
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	(To Complete)
Program Milestones	N/A	N/A	N/A	N/A	N/A
Engineering Milestones	Ongoing Integration	Blk 40/MLU Integration	Blk 50/MLU/CAS Integration	MLU/CAS On-goingIntegra	MLU/CAS On-going Integra
T&E Milestones	Blk 40 Follow on Testing	IPE Phase III Testing	Blk 50 Integration	On-going Testing	On-going Testing
Contract Milestones	MLU/CAS/ BAIpre-FSD	Continue	MLU/CAS/BAI Initiate HARM Launch Cap.FSD	Continue	Follow-on Multirole Fighter

Program Element: # 0207133F
PE Title: F-16 Squadrons
Project Number: # 2671
Budget Activity: #4-Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITES: There is a continuing need for modernization of the USAF and allied tactical fighter forces. Through the turn of the century, a multimission fighter is required to counter quantitative deficiencies in the tactical fighter force and modernize and supplement existing forces. The F-16C/D is intended to fulfill these requirements. The F-16 is a single-engine, single-seat, multirole tactical fighter with full air-to-air and air-to-surface combat capabilities. It will be employed in a complementary role to the F-15 in counter-air missions and as a primary aircraft in the surface attack role. It will replace aging F-4s and modernize the Air Reserve Forces. This project includes tasks to develop, integrate, and qualify systems to enhance the overall performance of the F-16 in the accomplishment of its mission. These improvements are grouped into a comprehensive, cost-effective Multinational Staged Improvement Program (MSIP). They include expanded air combat identification capability, updated electronic warfare suite, and incorporation of improved communication/identification equipment. In addition, this project develops enhanced night, under-the-weather attack capability in the air-to-ground role. Improvements include a higher maximum takeoff weight, improved air-to-air gun sight algorithms, digital flight controls, and improved pilot interface. Combat capability and versatility will be increased by integration of an Increased Performance Engine (IPE), and enhanced with the addition of advanced air-to-surface and air-to-air missiles and munitions. It develops enhanced computer and air-to-ground capabilities for Close Air Support (CAS)/Battlefield Air Interdiction (BAI) including a Modular Mission Computer (MMC), Digital Terrain System (DTS), Pave Penny, Dry Bay Fire Extinguisher, 30mm gun pod, and an Improved Data Modem (IDM) for retrofit into a planned quantity of 365 Block 30 F-16C/D aircraft. To continue to meet the increased threat of the 1990's a Mid-Life Upgrade (MLU) of the F-16A/B aircraft avionics will be conducted in concert with our European partners. Future plans include studies to upgrade F-16C/D avionics and computer systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Initiated development of an IDM.
   - (U) Completed F-16 Automatic Terrain Following Development Test and Evaluation.
   - (U) MLU began transition to FSD.
   - (U) Initiated CAS/BAI retrofit kit development activities.

2. (U) FY 1991 Planned Program:
   - (U) Initiate MLU FSD program.

3. (U) FY 1992 Planned Program:
   - (U) Initiate FSD for CAS/BAI retrofit program to include MMC, DTS, Pave Penny, dry bay fire extinguisher, 30MM gun pod and IDM development.
   - (U) Accomplish FSD for an aerial refueling probe and drogue capability.
   - (U) Continue FSD for MLU retrofit program.

Program Element: # 0207133F
PE Title: F-16 Squadrons
Project Number: # 2671
Budget Activity: #4-Tactical Programs

4. (U) FY 1993 Planned Program:
   - (U) Continue FSD for CAS/BAI and MLU retrofit programs.
     -- (U) Complete design review and continue MMC development.

5. (U) Program to Completion:
   - (U) Complete FSD of MLU and CAS/BAI retrofit kits.
   - (U) Initiate FSD for a follow-on multirole fighter program

D. (U) Work Performed By: The F-16 System Program Office of the Aeronautical System Division (ASD), Wright-Patterson Air Force Base, OH, has management responsibility for the F-16C/D program, F-16 Derivative program, as well as residual development task identified for the F-16A/B program. The F-16 System Program Management Division of the Ogden Air Logistics Center, Material Management Directorate, Hill AFB UT, has management responsibility for the F-16A/B program, with the exception of residual task retained by ASD under the Program Management Responsibility Transfer agreement. The major contractors are General Dynamics, Fort Worth, TX (airframe); Pratt & Whitney, East Hartford, CT and General Electric, Evendale, OH (engines), and Westinghouse, Baltimore, MD (radar). Major manufacturers include Fabrique Nationale, Belgium (engine); SABCA/SONACA, Belgium (aft fuselage, wings, and assembly); FOKKER, The Netherlands (center fuselage and assembly); TAI, Turkish Aerospace Industries, (mate through assembly); DAF, the Netherlands (landing gear); Per Udsen, Denmark (pylons and vertical fin); Kongsberg Vapenfabrikk, Norway (internal navigation set and fan drive module); and General Electric Corporation, England (heads-up display).

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRITIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Addition of MMC and probe and drogue development.
2. (U) SCHEDULE CHANGES: CAS/BAI retrofit development program delayed one year due to FY91 Congressional deletion of FSD funds.
3. (U) COST CHANGES: Total FY92 increase of $96,160K is due to $77,200K added for MMC development, $18,900K added for probe and drogue development as explained in E.1. above and a $60K miscellaneous items adjustment.

F. (U) PROGRAM DOCUMENTATION:
- (U) DCP #120, LWF Prototype, 1 Nov 72.
- (U) TAC ROC 303-76, F-16 Air Combat Fighter, 28 Dec 76.
- (U) DCP 3 143, Multipurpose Fighter (F-16) 8 May 78.
- (U) SON 28 Dec 78.
- (U) F-16C/D TEMP, 1 Feb 91.
- (U) TAF 303-76: F-16 SORD for the F-16 Block 50, 23 Jan 90
  F-16 SORD for the F-16 Block 40, 19 Jan 90
  F-16 SORD for the A-16, 3 Jan 90 (being updated)
- (U) Milestone IV ADM, CAS, 28 Nov 90

Program Element: # 0207133F
PE Title: F-16 Squadrons
Project Number: # 2671
Budget Activity: #4-Tactical Programs

G. (U) RELATED ACTIVITIES:
- (U) PE #0604249F, Night/Precision Attack.
- (U) PE #0603742F, Combat Identification Technology.
- (U) PE #0604218F, Engine Model Derivative Program.
- (U) PE #0604268F, Aircraft Engine Component Program.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

- (U) Procurement (BA 01F16X, P-1 Line Items 6 & 7)*:

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	3,138,556	2,128,716	1,253,546	816,517	158,492	34,949,700

* (Includes initial spares)

(U) Military Construction: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: The Air Force was directed in July 1987 by the Secretary of Defense to conduct a study of F-16 derivatives which would be suitable for a mid-1990s complement to the ATF and would be attractive to the European Participating Government (EPG) in the F-16 program. The EPG do not have a near term requirement for a new aircraft. However, they do need a Mid-Life Update (MLU) for their existing F-16A/Bs. Thus, to reach agreement with the EPG, it was necessary to include a MLU retrofit in the program. The MLU kit will be a major avionics upgrade to the current F-16A/B inventory. The basic kit will include a Modular Mission Computer, Digital Terrain System, APG-66 (V2A) radar upgrade, Improved Data Modem, Global Positioning System and Group A provisions for Night Vision Goggles and Microwave Landing System. In addition, several countries will also receive an Advanced Identification Friend or Foe and/or a Helmet Mounted Display. Initial funding for the program was from the NATO R&D appropriation (Nunn Amendment) which provided $8.0M of the FY1988 RDT&E appropriation. During preparation of the FY 1990/1991 amended President's budget, OSD canceled the F-16 derivative aircraft (Agile Falcon) portion of the program, leaving only MLU. In Feb 90, a development definition phase for MLU was initiated. Full Scale Development (FSD) was originally scheduled to begine on 2 Jan 91, but has been delayed to 15 Mar 91, pending full EPG authorization. USAF RDT&E funding ($102M) for FSD has been budgeted to cover the 5-year FSD period. The Production phase of the program is scheduled to begin in early 1994, with kit deliveries to commence in early 1996 and continue through early 2000.

Program Element: # 0207133F
PE Title: F-16 Squadrons
Project Number: # 2671
Budget Activity: #4-Tactical Programs

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
F-16A/B Improvements	Dec 76 to present	Extensive testing on ADF:improved A/A radar, AIM-7 capability, enhanced ECCM, advanced IFF,HF Radio and GPS
F-16C/D (MSIP) DT&E	Nov 82 to present	Airframe, and avionics testing related to Blk 30, 40, 50 improvements
F-16C/D FOT&E	Jun 85 to present	Blk 40 IOT&E completed 30 Oct 89

T&E ACTIVITY (TO COMPLETION)

Event	Planned Date	Remarks
F-16A/B Improvements	Aug 90 to Aug 91	Continue test on ADF system, AIM-7/AIM-120 integration, and software development for radar and advanced IFF.
F-16C/D (MSIP)	Aug 90 to Aug 91	Continued airframe and avionics testing related to Blk 30, 40, and 50 aircraft: stability and control, IPE, SEEK Eagle, avionics, ECM, and ECCM.
F-16C/D Stage III (AMRAAM, ALR-56M ALE-47, LANTIRN, GPS, RLG) IOT&E	Aug 90 to Aug 91	Continues integration testing on major subsystems. Each major subsystem incorporation will depend on its development schedule.
F-16C/D FOT&E	Continuing	Continue Tactical Air Command testing of Blk 40/42

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0207134F
PE Title: F-15E Squadrons

Project Number: # 0131
Budget Activity: #4 - Tactical Programs

Project Title: F-15 Squadrons



POPULAR NAME: F-15 EAGLE

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
($000)					
Major Contract	35,893	25,710	65,529	22,787	16,423
Support Contract	13,713	11,700	9,800	7,576	21,956
In-House Support	25,660	29,494	31,100	9,824	42,744
GFE/ Other	0	0	13,366	16,242	10,016
Total	75,266	66,904	119,795	56,429	91,139
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	N/A	N/A	N/A	N/A	N/A
Engineering Milestones	Ongoing Integration	Ongoing Integration	Ongoing Integration	Ongoing Integration	
T&E Milestones	Increased Performance Engine (IPE) Flt Test	Nuclear Cert Flt Test	Follow-on Weap Integ Flt Test	Ongoing Upgrades	Ongoing Upgrades
Contract Milestones	First Annual OFP Update	F-15 IPE Integration Complete	Complete Peace Fox Deliveries	Complete	N/A

Program Element: # 0207134F
PE Title: F-15E Squadrons
Project Number: # 0131
Budget Activity: #4 - Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The F-15E is the most capable 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-15E can deploy worldwide with minimal tanker support and arrive in a combat-ready configuration. The F-15E retains the basic air-to-air capability and adds systems necessary to meet the requirement for all-weather, deep penetration, and night/under-the-weather, air-to-surface attack. However, the emerging threat includes a new generation of aircraft possessing all-weather detection and kill capabilities. To maintain the F-15E's superiority against the threat through the 1990s, avionics, armament, airframe, and engine improvements are required. Avionics changes which exploit proven technological advances are being incorporated into the F-15E to provide expanded capability and support an updated and fully integrated electronic warfare suite. Further, this project develops enhanced capability for the air-to-ground role. In addition, overall combat capability will be increased by integration of an Increased Performance Engine (IPE), and a Very High Speed Integrated Circuit (VHSIC) Central Computer (CC) into the aircraft.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Continued development and testing of the improvements initiated in FY 1989 and prior.
   - (U) Continued design, test, and checkout of all MSIP changes and peculiar support equipment to ensure system compatibility.
   - (U) Continued IPE integration, RF compatibility efforts, VHSIC CC full scale development, and ECCM enhancements.
   - (U) Produced first annual operational flight program update.
   - (U) Fielded Mission Support System (MSS) II software.

2. (U) FY 1991 Planned Program:
   - (U) Plan and initiate activities necessary to assure successful F-15 post-production support and continue efforts required to achieve F-15 organic depot activation.
   - (U) Continue development and testing of the improvements initiated in FY 1990 and prior.
   - (U) Complete IPE integration and Vertical Tail redesign.
   - (U) Start RF Compatibility, Ground Collision Warning System, Standard Flight Data Recorder integration, and GPS integration efforts.
   - (U) Start Probe and Drogue aerial refueling integration.
   - (U) Continue flight test and RDT&E tasks associated with SEEK EAGLE, Tactical Electronic Warfare System (TEWS) integration, VHSIC CC development, advanced algorithm ECCM, combat identification (ID) improvements, MSS integration, and LANTIRN integration.

3. (U) FY 1992 Planned Program:
   - (U) Continue development and testing of the improvements initiated in FY 1991 and prior.
   - (U) Continue flight test and RDT&E tasks associated with SEEK EAGLE, TEWS integration, VHSIC CC development, RF compatibility, advanced algorithm ECCM, MSS integration, GCWS, Probe/Drogue, and LANTIRN enhancements/integration.

Program Element: # 0207134F
PE Title: F-15E Squadrons

Project Number: # 0131
Budget Activity: #4 - Tactical Programs

- (U) Initiate development of the Mobile Electronic Test Sets (METS) to replace obsolete and unsupportable F-15A-E avionics intermediate test stations.

4. (U) FY 1993 Planned Program:
   - (U) Continue development and testing of the improvements initiated in FY 1992 and prior.
   - (U) Complete VHSIC CC development, RF compatibility design, MSS integration, and LANTIRN integration.
   - (U) Continue flight test and RDT&E tasks associated with SEEK EAGLE, TEWS integration, advanced algorithm ECCM, combat ID improvements, GCWS, Probe/Drogue, SCSFDR, and GPS.

5. (U) Program to Completion:
   - (U) Complete tasks including SEEK EAGLE, TEWS integration, advanced algorithm ECCM and combat ID improvements, GCWS design, SCSFDR design, and GPS integration. This program is scheduled for completion with FY 1996 funding.

D. (U) Work Performed By: The F-15E development 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 Technology Corporation, West Palm Beach FL, is the engine contractor. Hughes Aircraft Company, Culver City CA, is the radar subcontractor to McDonnell-Douglas Corporation. Northrop Corporation, Rolling Meadows IL, is responsible for the ALQ-135 Internal Countermeasures System. Loral Corporation, Yonkers NY, is responsible for the ALR-56C Radar Warning Receiver. The major in-house developing organizations are Air Force Flight Test Center, Edwards AFB CA, Air Force Development Test Center, Eglin AFB FL, and Arnold Engineering Development Center, Tullahoma TN.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Initiation of probe/drogue and METS efforts.
2. (U) SCHEDULE CHANGES: GPS, GCWS, RF compatibility, and SCSRDR efforts delayed until late FY91 starts.
3. (U) COST CHANGES: A funding shortfall of $8.3M in FY90 and $22.2M in FY91 caused rephasing of the SCSRDR, GCWS, GPS, RF compatibility, radar improvement and associated flight test efforts. FY92 funding was increased by $19.1M for initiation of probe/drogue and by $13.4M for METS.

F. (U) PROGRAM DOCUMENTATION:
- (U) TAF ROC 9-68, Feb 68.
- (U) DCP #19, Rev C, May 77 as amended Feb 80.
- (U) TAF SON 321-82, Jan 84.
- (U) F-15E TEMP, Mar 90.
- (U) F-15E SORD, Feb 90.

G. (U) RELATED ACTIVITIES:
- (U) The TEWS for F-15 application is being developed in PE 0604270F.

Program Element: # 0207134F
PE Title: F-15E Squadrons

Project Number: # 0131
Budget Activity: #4 - Tactical Programs

- (U) The Joint Tactical Information Distribution System (JTIDS) is being developed for use on multiple aircraft including the F-15 under PE 0604754F (JTIDS).
- (U) The LANTIRN is being developed for the F-15E under PE 0604249F (Night/Precision Attack).
- (U) The IPE is being developed under PE 0604223F (Alternate Fighter Engine).
- (U) The Tactical Short Range Attack Missile (SRAM-T) is being developed for the F-15 under PE 0604245F.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

- (U) Procurement

FY 1990 Actual	FY 1991* Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Aircraft Procurement (BA 01) P-1 Line Item					
1,491,000	1,581,400	185,100	8,100	0	26,375,400

* PBD 161 reduced FY92 by $331M and FY93 by $278M to account for funds received from the sale of 24 F-15C/D Aircraft to Saudi Arabia. OSD(C) is adding an estimated $609M back to FY91 for peculiar support and non-recurring requirements originally budgeted for in FY92/93.

- (U) Military Construction: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None for F-15E.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
F-15E Phase IV DT&E	Sep 89	Completed
F-15E Phase V OT&E	Sep 89	Completed
F-15E Phase VII DT&E (Start)	Oct 89	Ongoing
F-15E Phase II DT&E	Dec 89	Completed
F-15E Phase VI FOT&E (Start)	Apr 90	Ongoing
F-15E IPE Flight Test (Start)	May 90	Ongoing
F-15E TEWS Early Operational Assessment	Nov 90	Completed
F-15E SRAM-T Early Vibration Flight Test	Dec 90	Ongoing
ALR-56C/ALQ-135 Band 3 Integration	Jan 91	Ongoing
First APG-70/AMRAAM Launch	Nov 90	Direct Hit

T&E ACTIVITY (TO COMPLETION)

Event	Planned Date	Remarks
F-15E TEWS OT&E (Start)	2Q FY92	TAWC, Eglin AFB
F-15E SRAM-T FSD (Start)	4Q FY93	6510TESTW, Edwards AFB

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0207136F Project Number: 3779
PE Title: Manned Destructive Budget Activity: # 4 - Tactical Programs
Suppression of Enemy Air Defenses

A. (U) RESOURCES ($ In Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Manned Destructive Suppression of Enemy Air Defenses (MDSEAD)	3,124	0	5,000	9,157	214,000	231,124

B. (U) BRIEF DESCRIPTION OF ELEMENT:
This element provides funds for the development and support of the Air Force's MDSEAD weapon system(s). The F-4G Wild Weasel is the sole operational, destructive, defensive suppression weapon system currently in the Air Force inventory. It provides man-in-the-loop capability to detect, identify, locate, and destroy the radars supporting hostile surface-to-air missile (SAM) and Anti-aircraft Artillery (AAA) systems. The High-speed Anti-radiation Missile (HARM) is the primary munition for SEAD. The requirement for continuation of this capability, TAF Statement of Operational Need 305-86, was validated on 4 November 1987. The basis of this requirement is the need to maintain a supportable, flexible and effective destructive capability against enemy threat system radars throughout and beyond the 1990s. This project expands the aircraft with HARM carriage (firing capability) to include the F-15E. It also provides both the F-15E and F-16C with Precision Direction Finding (PDF) capability, necessary for HARM targeting.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) No Project Number, MDSEAD:

(U) FY 1990 Accomplishments:
- (U) Rescoped Follow-On Wild Weasel Program
- (U) Initiated F-15E HARM Carriage Program
- (U) Defined and initiated studies to examine/evaluate system concepts for accomplishing Manned Destructive SEAD in 1995-2005 time frame.
- (U) Performed studies to evaluate the cost effectiveness of proposals for both On-Board and Off-Board approaches to HARM "Range Known" targeting on Fighter Aircraft.

Program Element: # 0207136F Project Number: 3779
PE Title: Manned Destructive Budget Activity: # 4 - Tactical Programs
Suppression of Enemy Air Defenses

(U) FY 1991 Planned Program: (FY 1990 funds)
- (U) Identify changes in F-15E Weapons computer required to launch HARM.
- (U) Initiate efforts to incorporate HARM Data requirements in F-15E.
- (U) Continue system concept studies/evaluation.
- (U) Continue program Pre-Phase 1 documentation requirements.

(U) FY 1992 Planned Program:
- (U) Update system concept, acquisition strategy and other program documents.
- (U) Initiate system risk reduction for F-15E Carriage and PDF.
- (U) Milestone 1 not later than FY 2/92.
- (U) Initiate DEM/VAL activities for HARM PDF.
- (U) Initiate efforts to minimize duplication of PDF efforts for the F-15E and F-16.

(U) FY 1993 Planned Program:
- (U) Initiate FSD efforts resulting from HARM targeting DEM/VAL.
- (U) Initiate integration of F-15E / HARM Carriage.
- (U) Continue efforts to minimize duplication of PDF efforts for the F-15E and F-16.

(U) Work Performed By: McDonnell Douglas, St Louis MO, is the expected primary contractor for the F-15E HARM Carriage, and F-15E PDF efforts. General Dynamics, Ft. Worth TX, is the expected primary contractor for the F-16C PDF efforts. Texas Instruments, Lewisville TX, produces the HARM. Air Force Systems Command is responsible for development.

(U) Related Activities:
(U) PE-0604270F (Electronic Warfare Development).
(U) PE-0207126F (High Speed Anti-Radiation Missile).
(U) PE-0207134F (F-15E Squadron).
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ In Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0207141F Budget Activity: #4-Tactical Programs
PE Title: F-117A Squadrons

A. (U) RESOURCES ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
F-117A	35,659	35,496				

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Provides for development and testing of a low observable tactical strike aircraft, the F-117A. The F-117A is designed to penetrate the threat integrated air defense system and employ against high-leverage targets at night. The primary weapons are laser guided bombs, which give the F-117A pinpoint accuracy and the capability to penetrate hardened targets. Through FY 88, 59 aircraft were procured; the last aircraft was delivered to Tactical Air Command in Jul 90. Two squadrons are operational with the 37th Tactical Fighter Wing at Tonopah Test Range, NV.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Completed Offensive Combat Improvement Program (OCIP) development and testing--included color mission displays, digital tactical situation display (moving map), and advanced autopilot with automatic recovery system.
   - (U) Development and testing to support aircraft software and mission data planning system (MDPS) updates continued.
   - (U) Began planning for F-117A environmental testing at the Climatic Laboratory, Eglin AFB, FL.
   - (U) Began studies for incorporation of a ring-laser gyro (RLG) inertial navigation system (INS).
   - (U) Completed studies for IR Acquisition and Designation System (IRADS) upgrades and began development.

2. (U) FY 1991 Planned Program:
   - (U) Continue development and testing to support aircraft software and MDPS updates.
   - (U) Conduct F-117A environmental testing at Eglin AFB, FL.
   - (U) Begin development for incorporation of a RLG INS.
   - (S) Continue development and begin testing of IRADS upgrade.

3. (U) FY 1992 Planned Program:
   - (U) Continue testing to support aircraft software and MDPS updates.
   - (U) Complete development and testing of a RLG INS.
   - (U) Complete development and testing of IRADS upgrade.

Program Element: # 0207141F Budget Activity: #4-Tactical Programs
PE Title: F-117A Squadrons

4. (U) FY 1993 Planned Program:
   - (U) Software and mission data planning system updates.
   - (U) Continuing program for follow-on test and engineering.

5. (U) Program to Completion:
   - (U) Continuing program for follow-on test and engineering.

D. (U) WORK PERFORMED BY: The prime contractor is the Lockheed Advanced Development Company, Burbank, CA. Texas Instruments, Dallas, TX is the sub to Lockheed for the IR Acquisition and Designation System.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Due to a reduction in funding Tactical Air Command modified the requirement for an integrated ring laser gyro (RLG)/ global positioning system (GPS) upgrade. The program will upgrade the inertial navigation system with an off-the-shelf RLG and investigate GPS alternatives.

2. (U) SCHEDULE CHANGES: Due to the reduction of RDT&E funds in FY93-94 and elimination of RDT&E funds in FY95 and out, the IRADS upgrade was begun in FY90 and will be completed by FY92.

3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION: N/A

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

- (U) Procurement (0207141F, F-117A Squadrons, P-70)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
	117,146	93,275		143,785	Cont.	TBD
Quantity	(0)	(0)	(0)	(0)	(0)	(59)

- (U) Military Construction

0	36,000		0	0	392,000

Program Element: # 0207141F Budget Activity: #4-Tactical Programs
PE Title: F-117A Squadrons

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) MILESTONE SCHEDULE:

1.	(U) FSD program initiated	Nov 1978
2.	(U) First production contract	Nov 1979
3.	(U) First flight	Jun 1981
4.	(U) First production delivery	Sep 1982
5.	(U) Initial Operational Capability	Oct 1983
6.	(U) Program acknowledged	Nov 1988
7.	(U) Program Management Responsibility Transfer	Oct 1989
8.	(U) Delivery of last F-117A	Jul 1990

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207161F
PE Title: Tactical Air Intercept Missile (AIM)

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)
Project Title: AIM-9M Product Improvement

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
AIM-9X	0	* 0	26,358	28,044	79,134	133,536

* Funded through OSD Program Element #0603715D

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
- (U) The AIM-9 short range missile (SRM) allows the destruction of enemy aircraft while denying electronic warning to their radar warning receivers. The missile is an accurate launch-and-leave weapon, and provides for self-defense in a countermeasures environment.
- (U) The AIM-9X addresses

- (U) Incremental improvements in missile allow retrofit of components to current missiles as a means of extending operational effectiveness of existing inventories at an affordable cost while continuing the evolution of the AIM-9 series.
- (U) A related effort to this R&D program is the AIM-9M-8/9 modification program, a near term, low cost modification to the USN and USAF inventory AIM-9M missiles. It addresses

is required as soon as possible

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments: Not applicable.

2. (U) FY 1991 Planned Program:
   - (U) USN and USAF signed MOA establishing a Joint SRM Program Office at PMA-259 with USN as lead Service. FY 91 funds placed in OSD account. Future funds to be placed in Service Program Elements for transfer to joint office.

Program Element: #0207161F
PE Title: Tactical Air Intercept Missile (AIM)

Budget Activity: #4 - Tactical Programs

- (U) Joint Requirements Oversight Council and Conventional Systems Committee validated requirement for a low cost modification to the AIM-9M inventory while simultaneously upgrading the AIM-9 design to pace the threat.
- (U) Develop joint mission need statement and begin concept exploration for AIM-9X. Requirement and concept exploration will address

3. (U) FY 1992 Planned Program:
   - (U) Complete concept exploration of candidates for AIM-9X. Develop a joint operational requirement for the AIM-9X to be fielded circa FY 2000.
   - (U) Begin demonstration validation (Dem/Val) phase for an AIM-9X seeker upgrade. Dem/Val phase will be parallel government/contractor efforts to reduce risk and provide two technical approaches. Contract award will be 3rd quarter FY 92.

4. (U) FY 1993 Planned Program:
   - (U) Continue Dem/Val of AIM-9X seeker with the beginning of captive flight test in 4th quarter FY 93.

5. (U) Program to Completion:
   - (U) Complete AIM-9X seeker Dem/Val (FY 95) and award a contract for engineering development (FY 95). Funding for this effort will be shared 50-50 with the USN.
   - (U) Develop for AIM-9X, Improvements will begin development in FY 94 and be compatible with both forward fit and retrofit to inventory AIM-9. Funding for this development work to be shared equally between USAF and USN.

D. (U) Work Performed By: The SRM Joint Program Office (PMA-259) will manage the AIM-9X development activities under the provisions of the USAF/USN MOA. The concept definition work will be performed by the Naval Weapons Center China Lake with USAF participation. The seeker Dem/Val will be done by defense contractors under management of the joint office.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:
   - (U) TAF (USAF 016-82)-I-B System Operational Requirements Document (SORD) for the Modified AIM-9M Missile (S), dated 13 Apr 90.
   - (U) Memorandum of Agreement for Short Range Air-to-Air Missile Programs (U), dated 9 Oct 90

Program Element: #0207161F
PE Title: Tactical Air Intercept Missile (AIM)

Budget Activity: #4 - Tactical Programs

G. (U) RELATED ACTIVITIES:
- (U) The Joint Tactical Air-to-Air Missile Oversight Committee and Steering Group provide executive level monitoring of SRM activities. Program execution by the Joint SRM Program Office under direction of the MOA will preclude unnecessary duplication.
- (U) Program Element #0604354N, AAM Systems Engineering (USN RDT&E)
- (U) Program Element #0603715D, (OSD Account)
- (U) Program Element #0207161F, AIM-9M Product Improvement (AIM-9M-8/9), P-1 Line Item 20.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands): Not Applicable.

I. (U) International Cooperative Agreements: Not applicable.

J. (U) MILESTONE SCHEDULE:

- (U) Initiate AIM-9X concept exploration	FY 91
- (U) Complete AIM-9X concept exploration	FY 92
- (U) Award contract/begin AIM-9X seeker Dem/Val	3 Qtr FY 92
- (U) Begin AIM-9X captive flight tests	4 Otr FY 93
- (U) Begin development of AIM-9X	FY 94
- (U) Complete AIM-9X seeker Dem/Val and award engineering development contract	FY 95

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207163F
PE Title: Advanced Medium Range Air-to-Air Missile (AMRAAM)
Project Number: 3777
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)
Project Title: AMRAAM Pre-Planned Product Improvement (P3I)

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
AMRAAM P3I	10,810	17,953	30,582	31,154	119,082	209,581

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The current Air Force/Navy developed AMRAAM responded to an urgent need of the US and NATO Tactical Air Forces which required a high performance missile to help compensate for the numerical advantage of Warsaw Pact fighter/interceptor aircraft. The P3I program provides for a research and development program which enhances the missile's capability and operational flexibility against mid-1990's and beyond threats, maximizes its compatibility with advanced fighters, incorporates high payoff technology developments, and investigates new variants and/or alternate missions that can utilize many of the current AMRAAM attributes.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Initiated Advanced Tactical Fighter (ATF) compatibility improvements for compressed carriage and performed ATF data link study
   - (U) Initiated Electronic Counter-Countermeasure (ECCM) upgrade to counter emerging threat countermeasure improvements

2. (U) FY 1991 Planned Program:
   - (U) Continue development of improvements begun in FY 1990.
   - (U) Initiate additional ECCM upgrades to counter additional emerging threat countermeasure improvements

3. (U) FY 1992 Planned Program:
   - (U) Continue development of improvements begun in FY 1990/1991.
   - (U) Provide for proof-of-design hardware for subsystem testing.
   - (U) Initiate study and analysis work to prepare other P3I projects to start full scale development as appropriate

4. (U) FY 1993 Planned Program:
   - (U) Continue development of improvements begun in FY 1990/1991.
   - (U) Provide for proof-of-manufacturing hardware for subsystem testing, missile integration and system level testing

Program Element: #0207163F
PE Title: Advanced Medium Range Air-to-Air Missile (AMRAAM)

Project Number: 3777
Budget Activity: #4 - Tactical Programs

Program Element #0205667N, F-14
Program Element #0204136N, F/A-18
Program Element #0604314N, AMRAAM (Navy RDT&E)
Program Element #0204162N, #0205138M, AMRAAM (Navy Proc)

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Joint Potential Designator to be determined at Milestone IIIB.

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

1. (U) Procurement: (Missile Procurement, BA 4, P-1 Line Item YY):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
PE 0207163F, AMRAAM						
Cost	681,416	535,298	768,432	867,031	4,074,955	9,245,600
Quantity	803	470	1000	1310	6963	12000
PE 0207590F, SEEK EAGLE						
Cost	4,667				41,092	45,759
Quantity	12				77	89
TOTAL						
Cost	686,083	535,298	768,432	867,031	4,116,047	9,291,359
Quantity	815	470	1000	1310	7040	12,089

2. (U) Military Construction: Not Applicable.

I. (U) International Cooperative Agreements: No cooperative agreements with Foreign Governments exist at this time for a P3I version of the AMRAAM missile system. Germany has withdrawn from the Memorandum of Understanding (MOU) for a Family of Advanced Air-to-Air Missile Systems between the Federal Republic of Germany (GE), the United Kingdom (UK), and the United States (US). The US does not favor continuing the MOU with the UK because the Advanced Short Range Air-to-Air Missile has not been developed. The UK and GE are expected to procure AMRAAMs through FMS.

J. (U) MILESTONE SCHEDULE:

1.	(U) Awarded Full Scale Development Contract	December 1981
2.	(U) Milestone IIIA (Low Rate Initial Production)	June 1987
3.	(U) Award Initial AMRAAM P3I Contracts	3 Qtr 1990
4.	(U) Initial Operational Capability	March 1991
5.	(U) Milestone IIIB (Full Rate Production)	April 1991
6.	(U) P3I Missile Free Flight Test Initiated	1 Qtr 1994
7.	(U) AMRAAM P3I Phase 2 Contract Award	1 Qtr 1995
8.	(U) P3I First Production Delivery. (Lot VIII Block Change)	2 Qtr 1996
9.	(U) Additional Production Changes	3 Qtr 1999

Program Element: #0207163F
PE Title: Advanced Medium Range Air-to-Air Missile (AMRAAM)
Project Number: 3777
Budget Activity: #4 - Tactical Programs

5. (U) Program to Completion:
   - (U) Missile upgrade projects to be completed in FY 1995. Production engineering change proposal expected in FY 1995
   - (U) Define and pursue additional changes in areas such as propulsion, ordnance, guidance, and electronic counter-countermeasures required to counter the evolving threat
   - (U) Phase 2 begins in FY 1995 and continues to complete development of Phase 2 improvements in FY 1999

D. (U) Work Performed By: This program is managed by the AMRAAM Joint System Program Office at the Aeronautical Systems Division, Eglin AFB FL. Production contracts have been awarded to Hughes Aircraft Company, Tucson AZ and Raytheon Company, Bedford MA. Hughes and Raytheon have formed a team to perform the AMRAAM P3I effort. A contract will be awarded to Hughes with Raytheon as subcontractor (project associate). Production competition will be retained.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: Initial Operational Capability (IOC) date now March 1991 due to missile availability and deployment of IOC squadron to Desert Shield. Initial AMRAAM P3I contracts delayed to 3rd quarter 1990 due to acquisition strategy approval cycle and a contractor suspension. P3I Phase I contract award now 2nd quarter FY 1991. Proof of Design hardware begins FY 1992 and proof of manufacturing hardware begins in FY 1993. P3I Missile Free Flight Test to be initiated 1st quarter 1994. First P3I missile delivery 2nd quarter 1996.
3. (U) COST CHANGES: $4.1 million of FY 1990 RDT&E funds were withdrawn to support reprogrammings and $7.6 million of the FY 1991 requested funds were not appropriated. The total program funding increased because FY 1997 funding is now included in the approved program (+$30.8M) and by adjustments for Defense Business Operations Fund (+$2.7M) and for technical and engineering services (-$6.9M). FY 1991 and beyond funds are required to complete Phase I and to define and pursue additional changes to counter the evolving threat and complete development for the missile buyout.

F. (U) PROGRAM DOCUMENTATION:

- JSOR (USAF ROC 9-76)	Sep 78	SORD	Jan 90
- MENS	Nov 78	STAR	Jun 90
- SOC	Jul 86	TEMP	Nov 90
- DCP	Apr 87		

G. (U) RELATED ACTIVITIES:
- (U) AMRAAM integration with the following programs:
  Program Element #0207130F, F-15
  Program Element #0207133F, F-16
  Program Element #0603230F, #0604239F, Advanced Tactical Fighter

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207215F
PE Title: TR-1 Squadrons
Project Number: 3314
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES: ($ In Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
TR-1	109,824	49,317	54,220	21,879	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The TR-1 Tactical Reconnaissance System provides the United States national community, U&S Commands and allied forces in a contingency operation as well as the NATO Central Region with near-real-time battlefield surveillance using the Advanced Synthetic Aperture Radar System (ASARS-2) imaging radar carried aboard the TR-1 aircraft. The resulting intelligence gives tactical commanders the ability to attack or otherwise react to enemy activities deep inside enemy territory. TR-1 sensor data is processed and exploited in the Tactical Reconnaissance Exploitation Demonstration System (TREDS) located at The TR-1 program is developing the TR-1 Ground Station (TRIGS) which will consist of a The deployable segment will be available to respond to any crisis situation and the fixed site will provide coverage until the deployable station is in place. The TRIGS and TREDS segments will provide mission planning and control and imagery processing and exploitation. The two ground stations will also coordinate various sensor exploitation segments to form an integrated battlefield reconnaissance system.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) System level TRIGS integration started at the contractors facility.
   - (U) Phase One of the CONUS flight testing was completed in July.

2. (U) FY 1991 Planned Program:
   - (U) TRIGS system integration will be completed.
   - (U) CONUS flight testing of all TRIGS operational segments will be completed.
   - (U) Development of an on-board processing capability for the ASARS is continuing.
   - (U) TREDS Maintainability Modifications (TMM) integration will be completed.

Program Element: #0207215F
PE Title: TR-1 Squadrons
Project Number: 3314
Budget Activity: #4 - Tactical Programs

3. (U) FY 1992 Planned Program:
   - (U) TRIGS equipment modifications for Congressionally directed deployable segment wil start.
   - (U) Shelter acquisition and equipment installation will continue.

4. (U) FY 1993 Planned Program:
   - (U) TRIGS deployable segment modifications and shelterization will be completed.
   - (U) The Commanders Tactical Terminal will be integrated into TREDS.

5. (U) Program to completion:
   - (U) The TRIGS deployable ground station will achieve initial operational capability by
   - (U) AFOTEC will conduct TRIGS operational testing after TRIGS initial operational capability, and deficiencies will be corrected in the out-years.

D. (U) WORK PERFORMED BY: The program office is the Air Force Aeronautical Systems Division, Wright-Patterson AFB OH. The TRIGS prime contractor is Loral (formerly Ford Aerospace Corp.), San Jose CA. The ASARS-2 contractor is Hughes Radar Systems Group, Culver City, CA. The aircraft contractor is Locheed Corp., Burbank, CA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Due to Congressional direction not to deploy to Europe, the TRIGS equipment must be restructured/ reconfigured for installation into either a deployable system or a fixed CONUS site or both.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: The cost to field the CONUS based TRIGS is slightly less than the cost for installation in the European bunker.

F. (U) PROGRAM DOCUMENTATION:
   - (U) TAF ROC 315-75, All Weather Target Acquisition System, 9 April 1975, revised 3 May 1977 (S).
   - (U) Mission Element Need Statement for Continuous Battlefield Standoff Surveillance 6 August 1979 (S/NOFORN).

G. (U) RELATED ACTIVITIES:
   - (U) Side-Looking Airborne Radar (SLAR), Program Element 0604756F. Funds the airborne radar system and ground processing equipment.
   - (U)

   - (U) US Army Tactical Radar Correlator (TRAC), Program Element 0604740D662, procurement line BA0329. Procuring a second TRAC which could be loaned to the TR-1 program to provide the ASARS ground processor for the deployable ground station.

Program Element: #0207215F Project Number: 3314
PE Title: TR-1 Squadrons Budget Activity: #4 - Tactical Programs

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	Total Program
1. (U) Aircraft Procurement BA04				
- (U) BP11 and BP16 Funds	25,460	19,748	66,909	Continuing
- (U) BP19 Funds	10,285	31,207	20,459	Continuing
- (U) Total	35,745	50,955	87,368	Continuing
- (U) Quantity	0	0	0	23
(All aircraft already delivered, funds are for modifications)				
(U) Other Procurement BA04				
- (U) Funds	11,655	0	62,207	Continuing
- (U) Quantity	0	0	0	2
2. (U) Military Construction BA04				
- (U) Funds	3,900	0	0	29,900

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: The US Air Force signed a interoperability agreement in April 1987

J. (U) MILESTONE SCHEDULE:

1. (U) First TR-1 Contract	November 1979
2. (U) Prototype Ground Station Contract Award	July 1981
3. (U) First TR-1 Delivered	September 1981
4. (U) ASARS-2 Operational Evaluation	November 1982
5. (U) ASARS-2 Production Award	September 1983
6. (U) Prototype Ground Station Delivery to Europe	August 1985
7. (U) TREDS TMM Completion	
8. (U) TRIGS Deployable Ground Site Initial Operational Capability (may be accelerated)	

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207217F
PE Title: Follow-on Tactical Reconnaissance System

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3201 Tactical Air Reconnaissance System	46,450	33,562	14,854	1,858	4,033	193,057
3364 Joint Services Imagery Processing System	34,398	12,093	6,000	5,500	2,800	116,291
3792 F-16	0	0	35,699	50,638	9,000	95,337
Total	80,848	45,655	56,553	57,996	15,833	404,685

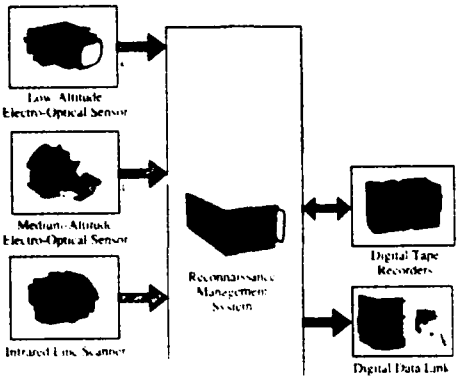
B. (U) BRIEF DESCRIPTION OF ELEMENT: The Follow-on Tactical Reconnaissance System (FOTRS) is an umbrella concept consisting of an airborne portion called the Advanced Tactical Air Reconnaissance System (ATARS) and a ground portion called the Joint Services Imagery Processing System (JSIPS). The program's primary objective is the upgrade of USAF, USN, and USMC tactical penetrating reconnaissance systems. The USAF portion of ATARS consists of two development projects: Project 3201, Tactical Air Reconnaissance System (TARS), and Project 3792, a reconnaissance-capable F-16C. The JSIPS portion is known as Project 3364. TARS focuses on the full-scale development of a common sensor suite (digital electro-optical and infrared sensors, datalink, recorders, and management system) for the upgrade of USAF, USMC, and USN manned and unmanned reconnaissance systems. The Air Force will integrate TARS into a tactical reconnaissance pod for carriage on the F-16, while the Navy will carry TARS internally in the USMC F/A-18D(RC) and USN F/A-18C(RC). TARS will also be the reconnaissance payload on the USAF, USN, and USMC Unmanned Aerial Vehicle Medium-Range (UAV-MR). The F-16 project will develop a tactical reconnaissance pod and modify existing F-16s to provide "hands-on, heads-up" cockpit reconnaissance controls and displays for a low-altitude, day/night, through-the-weather capability. JSIPS focuses on the development of an all-Service ground exploitation system capable of receipt, processing, and exploitation of multi-sensor tactical imagery (EO/IR/radar). The ground station will have commonality with Air Force, Navy, and Marine Corps manned and unmanned systems.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207217F
PE Title: Follow-on Tactical Reconnaissance System

Project Number: 3201
Budget Activity: #4 - Tactical Programs

Project Title: Tactical Air Reconnaissance System



POPULAR NAME: TARS

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Compl
Major Contract	38,300	29,363	7,600	1,000	2,252
Support Contract	2,670	1,280	4,754	0	0
In-House Support	1,970	1,500	1,200	858	1,781
GFE/ Other	3,510	1,419	1,300	0	0
Total	46,450	33,562	14,854	1,858	4,033

SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	To Compl
Program Milestones	N/A	N/A	IIIA F/A-18D(RC)	III F-16	IIIA/IIIB UAV-MR
Engineering Milestones	CDR Hardware Deliveries	Hardware Deliveries	N/A	N/A	N/A
T&E Milestones	N/A	CFT/DT&E RF-4C DT&E F/A-18D(RC)	DT&E/OA RF-4C OT&E F/A-18D(RC)	DT/OT&E F-16	MULTI-SERV OT&E UAV-MR
Contract Milestones	N/A	N/A	Complete FSD Begin Prod.	Continue Production	Cont Prod Thru FY02

Program Element: #0207217F
PE Title: Follow-on Tactical Reconnaissance System
Project Number: 3201
Budget Activity: #4 - Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The Tactical Air Reconnaissance System (TARS) is a full-scale development (FSD) project which meets the needs of tactical commanders for responsive and timely location and classification of tactical targets. This project focuses on the development of a common sensor suite consisting of Electro-Optical (EO) and Infrared (IR) sensors, data link, recorders and reconnaissance management system for carriage on USAF, USMC, and USN manned and unmanned reconnaissance systems. The Air Force will integrate the TARS sensor suite into a reconnaissance pod for the F-16 and into the Unmanned Aerial Vehicle Medium-Range (UAV-MR). The Air Force designation for the UAV-MR with the TARS payload is the Unmanned Air Reconnaissance System (UARS). The RF-4C will serve as the sensor validation test bed in support of F/A-18D(RC), F-16, and UAV-MR integration testing.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Critical Design Review action items closed 1 February 1990.
   - (U) RF-4C Class II modification for carriage of TARS.
   - (U) RF-4C TARS/platform integration continued.
   - (U) RF-4C test preparation continued.

2. (U) FY 1991 Planned Program:
   - (U) Six engineering models delivered.
   - (U) Contractor/Government TARS validation testing begins in RF-4C.
   - (U) TARS integration testing begins in F/A-18D(RC).

3. (U) FY 1992 Planned Program:
   - (U) Three more engineering models delivered for a total of nine.
   - (U) TARS testing in F/A-18D(RC) continues.
   - (U) TARS Milestone IIIA decision for F/A-18D(RC) in FY 3/92.

4. (U) FY 1993 Planned Program:
   - (U) Reconnaissance pod/TARS integration.
   - (U) F-16 TARS-equipped reconnaissance pod testing.
   - (U) Milestone III decision for F-16 in FY 4/93.

5. (U) Program to Completion:
   - (U) UAV-MR Milestone IIIA AND IIIB sensor decisions not yet defined; program is currently undergoing a restructure.
   - (U) Procure TARS through FY02 (projected) in support of UAV-MR.

Program Element: #0207217F
PE Title: Follow-on Tactical Reconnaissance System
Project Number: 3201
Budget Activity: #4 - Tactical Programs

D. (U) WORK PERFORMED BY: The Prime contractor for the Tactical Air Reconnaissance System (TARS) development is Martin-Marietta Corporation (MMC), Orlando FL. MMC bought the Control Data Corporation (former prime contractor) Reconnaissance Division in October 1990. The Aeronautical Systems Division, Wright-Patterson AFB OH, has in-house management responsibility for system Development. Subcontractors supporting the TARS project are as follows:

E-Systems	Greenville, Tx	RF-4C Group A Hardware
Loral Fairchild System	Syosset, NY	EO Sensors
Loral Infrared Imaging Systems	Lexington, Ma	IR Line Scanner
Datatape	Pasadena, Ca	Digital Tape Unit
UNISYS	Salt Lake City, Ut	Data Link
Computing Devices - Hastings	Hastings, UK	Management System

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: Contractual and Critical Design Review (CDR) delays, as outlined in the previous submission, have delayed deliveries of the flight test systems. In January 1991 the Air Force will receive the first flight worthy system and expect delivery of the remaining eight systems by the end of Calender Year 1991. Therefore, flight testing, last reported as beginning in November 1990, will now start in February 1991. Due to the Air Force decision not to upgrade the RF-4C and delays in the Unmanned Program, the procurement contract has been altered resulting in a Milestone IIIA decision in FY3/92, vice FY4/91. The change will support sensor procurement for the first operational TARS-equipped platform, the USMC F/A-18D(RC). The UAV-MR program is currently undergoing a restructure and the UAV Joint Program Office is refining the development, test, and milestone schedules.

3. (U) COST CHANGES: In FY90, $15.198M was shifted from the TARS project to the Joint Service Imagery Processing System (JSIPS) project to support the TAF's auto-queuing requirement and to decrease outyear government obligations on the JSIPS prime contract. Auto-queuing is primarily a ground station function and is expanded on under the JSIPS project. We reported in our last submission that $2M from the TARS project will fund a portion of the FY91 F-16 project. FY91 Congressional Appropriations language prevents expenditure of

Program Element: #0207217F
PE Title: Follow-on Tactical Reconnaissance System
Project Number: 3201
Budget Activity: #4 - Tactical Programs

FY91 funds on the F-16 and reduced total program funding by $770K. A portion of the reduction was taken from the $2M destined for the F-16. The remainder of the $2M will support the TARS/Electro-Optical Long Range Oblique Photography (EO LOROP) compatibility effort in support of the USN, USMC, and USAF EO LOROP requirement. FY92 funding changes are the result of inflation adjustments and Defense Management Report initiatives. FY93 and beyond adjustments support the F-16 effort.

F. (U) PROGRAM DOCUMENTATION:
- (U) TAF SON, 7 Aug 79
- (U) MENS, May 81
- (U) JMENS, Mar 82
- (U) SDDM, 30 Mar 87
- (U) TAF SON, 18 Dec 87
- (U) PDM, 14 Jul 88
- (U) TEMP, 10 May 89
- (U) TAF SORD, 9 Feb 90

G. (U) RELATED ACTIVITIES:
- (U) USAF/USN Memorandum of Agreement on Unmanned Air Reconnaissance Vehicle.
- (U) Joint Program Office for Unmanned Air Vehicles. DOD Joint Unmanned Air Vehicle Program, PE 030514D.
- (U) PE 0204136N, F/A-18.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) PE 0207213F, Classified Modifications. This PE contains prior year Electro-Optical Long Range Oblique Photography (EO LOROP) funding.

H. (U) OTHER APPROPRIATION FUNDS:

- (U) Procurement (3010, #4 - Tactical Programs, Line Item 146):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost *	0	0	10,060	60,634	450,678	521,372
Qty Sensors	0	0	0	20	85	105
Pods	0	0	0	20	118	138
Kits	0	0	0	20	130	150

* Cost includes sensor/pod/kit procurement, sensor/pod/kit installation, spares, War Reserve Spares Kits (WRSK), other government costs (also reflected under the F-16 Project - #3792)

- (U) Military Construction: Not applicable.

Program Element: #0207217F
PE Title: Follow-on Tactical Reconnaissance System
Project Number: 3201
Budget Activity: #4 - Tactical Programs

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None. Federal Republic of Germany has lost interest in upgrading their RF-4Cs. However, they have recently requested technical data for placing TARS components in their Electronic Combat-Reconnaissance (ECR) Tornado. Spain has also requested Price and Availability data for equipping their F/A-18D(RC)s and RF-4Cs with TARS and EO LOROP. The Royal Netherlands Air Force maintains its interest in the TARS system.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
N/A	N/A	N/A

T&E ACTIVITY (TO COMPLETION)

Event	Date	Remarks
CFT/DT&E	2Q/FY 1991	RF-4C Contractor Flight Test
DT&E	2Q/FY 1991	RF-4C Government Flight Test
DT&E/OA/OT&E	FYs 1991-1992	RF-4C & F/A-18D(RC)
DT&E/OT&E	FY 1993	TARS-equipped F-16

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207217F
PE Title: Follow-on Tactical Reconnaissance System
Project Number: 3364
Budget Activity: #4 - Tactical Programs

Project Title: Joint Services Imagery Processing System



POPULAR NAME: JSIPS

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Major Contract	27,698	8,473	4,210	3,960	1,400
Support Contract	4,100	2,400	850	790	1,250
In-House Support	2,600	1,220	290	250	150
GFE/ Other	0	0	650	500	0
Total	34,398	12,093	6,000	5,500	2,800

SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	N/A	N/A	III Nat'l & Tactical JSIPS	III MVS	Field Systems
Engineering Milestones	System CDR Complete	Define USN Shipboard & USAF MVS Requirements	MVS CDR	N/A	Field Systems
T&E Milestones	N/A	DT&E 1 & 2 Multi-Service OT&E (MOT&E)	JSIPS Support for TARS-Equipped Tactical Platforms' DT/OT/MOT&E		
Contract Milestones	N/A	Restructure Complete	N/A	N/A	N/A

Program Element: #0207217F
PE Title: Follow-on Tactical Reconnaissance System
Project Number: 3364
Budget Activity: #4 - Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The Joint Service Imagery Processing System (JSIPS) provides a common transportable system capable of receiving, processing, and exploiting, in softcopy or hardcopy, national and tactical imagery. JSIPS will replace the costly and manpower/logistics intensive Photo Processing and Interpretation Facilities (PPIFs) associated with the RF-4C. JSIPS will meet the Tactical Commander's need for timely and responsive imagery for the detection, location and classification of tactical targets. JSIPS will provide the Tactical Air Reconnaissance System (TARS) project with a ground station using modular, exportable technology. JSIPS will support USAF, USN, and USMC manned and unmanned reconnaissance vehicles. JSIPS can be configured in one of three ways: National Receive Segment; Tactical Receive Segment; or National and Tactical Receive Segments. As part of a multi-Service program, JSIPS also supports the USMC All Source Imagery Processor and the Army Imagery Processing and Dissemination System requirements.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) CDR action items closed out in August 1990.
   - (U) Accepted National Input Segment (NIS).
   - (U) Successful NIS software testing.
   - (U) Integrated NIS to SATCOM.
   - (U) Successful in passing imagery from source to Softcopy Exploitation Segment.
   - (U) Successful imagery exploitation.

2. (U) FY 1991 Planned Program:
   - (U) Define USN shipboard JSIPS requirements and USAF squadron-level Mission Verification System (MVS) requirements.
   - (U) Conduct DT&E and Multi-Service OT&E in support of FY91 RF-4C sensor validation testing and follow-on TARS-equipped platform testing (USMC F/A-18D(RC)(RC), UAV-MR, and F-16).
   - (U) JSIPS contract restructure completed.

3. (U) FY 1992 Planned Program:
   - (U) Milestone III decision for National and Tactical JSIPS.
   - (U) Continue to support testing of TARS-equipped platforms.

4. (U) FY 1993 Planned Program:
   - (U) Milestone III decision for MVS.
   - (U) Continue to support testing of TARS-equipped platforms.

5. (U) Program to Completion:
   - (U) Continue to support testing of TARS-equipped platforms.
   - (U) Field JSIPS and MVS.

Program Element: #0207217F
PE Title: Follow-on Tactical Reconnaissance System
Project Number: 3364
Budget Activity: #4 - Tactical Programs

D. (U) WORK PERFORMED BY: The contractor for full-scale development of the Joint Service Imagery Processing System (JSIPS) is E-Systems, Garland TX. Electronic Systems Division, Hanscom AFB MA, has responsibility for in-house management. Subcontractors supporting the JSIPS project are as follows:

Brunswick	Marion, Va	Shelters
CALSPAN	Alexandria, Va	CATIS Augmentation
Autometric	Alexandria, Va	Hard Copy Exploitation
Fairchild	Sarasota, Fl	Digital Tape Unit
UNISYS	Salt Lake City, Ut	Data Link
CONTEL	Westlake Village, Va	IWS Software Porting

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: The JSIPS project was restructured to compensate for an FY 89 funding shortfall. JSIPS is in the final stages of the restructure approval process with an estimated completion of April 1991. Auto-queuing, Mission Verification System (MVS), and Electro-Optical Long Range Oblique Photography (EO LOROP) compatibility have been added to meet requirements. Auto-queuing allows multiple airborne platform datalink queries to a ground station, prioritizes these queries, and automatically initiates the data link handshake with the next platform in cue once the previous platform terminates the link. Due to the datalink capability of JSIPS, the traditional recce squadron-to-TACC step in the dissemination process is eliminated. JSIPS will now be deployed at force-level. However, a requirement for aircrew mission verification and sensor maintenance does exist. The MVS, a low-cost, scaled down playback capability, fills this requirement.

2. (U) SCHEDULE CHANGES: In FY91, the IOT&E has been replaced by a Multi-Service OT&E due to the variety of platforms JSIPS will support in testing. USAF JSIPS National System Milestone III decision was moved from FY91 to FY92. The FY91 Milestone decision was scheduled for last month of FY91 and would have made it difficult to obligate and/or expend the funds in such a short timeframe. The Tactical system Milestone III decision was also moved to FY92 to align with the USMC F/A-18D(RC) sensor Milestone III decision. The MVS Milestone III decisions remains in FY93 to align with the F-16 sensor, pod, and aircraft modification kit procurement schedule.

Program Element: #0207217F
PE Title: Follow-on Tactical Reconnaissance System
Project Number: 3364
Budget Activity: #4 - Tactical Programs

3. (U) COST CHANGES: In FY90, JSIPS received an additional $15.198M from TARS to meet the TAF auto-queuing requirement, MVS development, and to lower outyear government obligation on the prime contract. The previous submission reported that JSIPS would provide $6M in FY91 to the F-16. FY91 Congressional Appropriations language prohibits the use of FY91 funds for the F-16 and reduced the total program funding by $770K. To this end, the $6M will remain in the JSIPS program to cover a $4.8M FY91 funding shortfall. The remainder will be used to meet the JSIPS-EO LOROP compatibility requirement for the USN, USMC, and USAF. Funding changes in the outyears are a result of inflation adjustments and Defense Management Report initiatives. MVS procurement funding will be offset by the reduction to four force-level JSIPS and one Test/Training system. The Test/Training system differs only from the force-level JSIPS in its throughput capability.

F. (U) PROGRAM DOCUMENTATION:
- (U) SOC, Jan 87
- (U) Son, USAF 002-85, Feb 88
- (U) JSORD, Aug 89
- (U) Temp, Dec 89

G. (U) RELATED ACTIVITIES:
- (U) MOAs with USN, USA and USMC. PE 060373A and PE 0604718M.
- (U) PE 27435F funds the MVS and the JSIPS national and tactical system procurement.
- (U) PE 0207213F, Classified Modifications. This PE contains prior year Electro-Optical Long Range Oblique Photography (EO LOROP) funding.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

Program Element: #0207217F
PE Title: Follow-on Tactical Reconnaissance System
Project Number: 3364
Budget Activity: #4 - Tactical Programs

H. (U) OTHER APPROPRIATION FUNDS:

- (U) PROCUREMENT: (3080, #4 - Tactical Programs, Line Item 146):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
PE 27435F						
Cost	0	0	21,881	19,459	98,040	139,380
Qty JSIPS	0	0	1	1(T/T)	3	5
MVS	0	0	0	1	6	7

Note: (T/T) = Test/Training
- Procurement adjusted to align with USAF manned/unmanned systems

- (U) MILITARY CONSTRUCTION: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
N/A	N/A	N/A

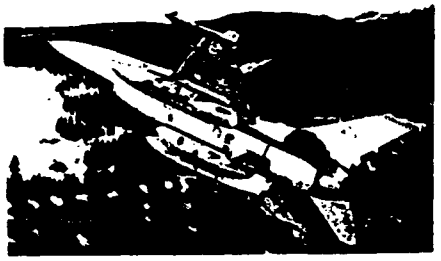
T&E ACTIVITY (TO COMPLETION)

Event	Date	Remarks
DT&E 1/DT&E 2/MOT&E	FY 1991	Multi-Service OT&E
Platform Support	Thru FY 1995	TARS-equipped manned/ unmanned platforms
MVS DT&E/OT&E	FY 1992-1993	

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207217F
PE Title: Follow-on Tactical Reconnaissance System
Project Number: 3792
Budget Activity: #4 - Tactical Programs

Project Title: F-16



POPULAR NAME: RECCE FALCON

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Major Contract	0	0	31,855	45,668	7,140
Support Contract	0	0	1,784	1,600	1,210
In-House Support	0	0	1,010	2,080	650
GFE/ Other	0	0	1,050	1,290	0
Total	0	0	35,699	50,638	9,000

SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	N/A	N/A	II	III	Field System
Engineering Milestones	N/A	N/A	PDR CDR	N/A	N/A
T&E Milestones	N/A	N/A	N/A	DT&E/OT&E	N/A
Contract Milestones	N/A	N/A	F-16 ECP T&M Contract FSD	Production Decision	Field System

Program Element: #0207217F
PE Title: Follow-on Tactical Reconnaissance System
Project Number: 3792
Budget Activity: #4 - Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The CinCs and the Joint Staff support the Air Force's requirement for a follow-on manned tactical reconnaissance system to replace the aging RF-4C. A reconnaissance capable F-16 meets the requirement in capability and cost-effectiveness. The F-16 project focuses on modifying existing F-16 aircraft to provide a low-level, day/night, all-weather reconnaissance capability through a terrain-following modification to the APG-68 radar and a fully integrated tactical reconnaissance pod containing the Tactical Air Reconnaissance System (TARS). The F-16 will have reconnaissance controls and displays which will use existing hardware to provide the pilot with a "hands-on, head-up" capability. The TARS-equipped F-16 will be compatible with the Joint Service Imagery Processing System. This project builds on planning and demonstrations previously conducted for the Follow-On Tactical Reconnaissance System in the 1986 F-16 reconnaissance demonstration/validation.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments: Not Applicable.

2. (U) FY 1991 Planned Program: Not Applicable.

3. (U) FY 1992 Planned Program:
   - (U) Start of F-16 effort by capitalizing on CY 1986 Dem/Val.
   - (U) F-16 ECP initiated.
   - (U) Time and Materiel risk reduction effort spans gap between ECP and Full Scale Development (FSD) go-ahead to meet
   - (U) FSD (Milestone II).
   - (U) Preliminary Design Review (PDR).
   - (U) Critical Design Review (CDR)
   - (U) Conduct Cockpit Missionization Simulation.

4. (U) FY 1993 Planned Program:
   - (U) Pod and Sensor Integration.
   - (U) Test assets delivered and flight test preparation.
   - (U) Conduct DT&E and OT&E for Pod, Sensors, and Terrain-Following (TF) Radar Modification.
   - (U) Sensor, Pod, and Kit Production Decision (Milestone III).

5. (U) Program to Completion:
   - (U) TF Radar Safety of Flight Certification.
   - (U) Field System.

D. (U) WORK PERFORMED BY: Contractor not yet selected. The Aeronautical Systems Division, Wright-Patterson AFB Oh, has in-house responsibility for system development.

Program Element: #0207217F
PE Title: Follow-on Tactical Reconnaissance System
Project Number: 3792
Budget Activity: #4 - Tactical Programs

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: The scope of the requirement exceeds the capabilities of the current RF-4C. The reconnaissance capable F-16 will have a day/night, all weather flight capability with growth potential capitalizing on ongoing F-16 efforts.

2. (U) SCHEDULE CHANGES: The Air Force projects an with the FY92 start. This differs from our last submission due to Congressional Appropriations language prohibiting the expenditure of FY91 funds for the F-16 effort.

3. (U) COST CHANGES: Due to the one-year slip in the start of the effort, the funding profile has been adjusted to reflect the projected level of effort.

F. (U) PROGRAM DOCUMENTATION:
- (U) TAF SON, 7 Aug 79
- (U) MENS, May 81
- (U) JMENS, Mar 82
- (U) SDDM, Mar 87
- (U) TAF SON, Apr 88
- (U) PDM, Jul 88
- (U) SORD, Apr 90

G. (U) RELATED ACTIVITIES:
- (U) None.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

- (U) PROCUREMENT: (3010, #4 - Tactical Programs, Line Item 146):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost *	0	0	10,060	60,634	450,678	521,372
Qty Sensors	0	0	0	20	85	105
Pods	0	0	0	20	118	138
Kits	0	0	0	20	130	150

* Cost includes sensor/pod/kit procurement, sensor/pod/kit installation, spares, War Reserve Spares Kits (WRSK), other government costs (also reflected under the TARS Project - #3201)

- (U) MILITARY CONSTRUCTION: Not applicable.

Program Element: #0207217F
PE Title: Follow-on Tactical Reconnaissance System
Project Number: 3792
Budget Activity: #4 - Tactical Programs

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Renewed Dutch interest in tactical reconnaissance pod. Possible cooperative effort.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
N/A	N/A	N/A

T&E ACTIVITY (TO COMPLETION)

Event	Date	Remarks
DT&E/OT&E	FY 1993	Pod/Sensors/Kits
Terrain-Following (TF) Radar Flight Certification	FYs 1994-1995	TF Master Tape

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207247F Budget Activity: #4 - Tactical Programs
PE Title: Air Force TENCAP

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
0001 TENCAP	335	346	562	679	Cont	TBD
Total	335	346	562	679	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program develops procedures, tactics and interface equipment/software to demonstrate the tactical use of within an operational combat framework and to influence the design and operation of capabilities to improve tactical support.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 0001, TENCAP: Efforts include participating in tactical exercises, prototyping software/hardware for interfacing with existing C3I and combat support systems, conducting conceptual studies, and providing

(U) FY 1990 Accomplishments:
- (U) Refined software integration of multiple products for
- (U) For BRIGHT STAR exercise, developed a prototype CONSTANT SOURCE terminal capable of evaluated its airborne operation on a C-141
- (U) Participated in Joint Army/USAF exercise to evaluate the application of

(U) FY 1991 Planned Program:
- (U)
- (U) Participate in JCS Special Project (a joint TENCAP exercise with location and specific objectives TBD).
- (U) Investigate/evaluate the utility of integrating
- (U) Develop Tactical Impact Statements/assessments on new and/or upgraded

Program Element: # 0207247F Budget Activity: #4 - Tactical Programs
PE Title: Air Force TENCAP

(U) FY 1992 Planned Program:
- (U) Prototype a ruggedized low cost work station to receive, correlate and display all source intelligence data.
- (U) Demonstrate an airborne deployable, jam-resistant and secure system to receive and process imagery.
- (U) Develop a standard architecture for inputting TENCAP derived data into aircraft avionics systems.

(U) FY 1993 Planned Program:
- (U) Investigate new algorithms to compress imagery data in order to reduce communication bandwidth requirements.
- (U) Study echniques to manipulate to satisfy tactical user needs.
- (U) Evaluate AI contributions for improving interfaces with data bases.

(U) Work Performed By: Air Force management of this effort is under the Air Force Deputy Chief of Staff for Plans and Operations, Headquarters USAF, Washington, DC.

(U) Related Activities:
- (U) Program Element #0305159I, Defense Reconnaissance Support Program
- (U) Program Element #0305158F, CONSTANT SOURCE
- (U) Program Element #0304111F, Special Activities
- (U) Program Element #0301313F, Defense Dissemination System
- (U) TENCAP formally interfaces with numerous national programs/agencies, the Major Commands and their components, the Air Staff, Office of the Secretary of Defense, Secretary of the Air Force, and the other Services in order to effectively influence the designs and concepts of the
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):

(U) Other Procurement (PE #0207247F, BA #4):

	FY 1990 Actual	FY 1991 Estimate	FY1992 Estimate	FY1993 Estimate	To Complete	Total Program
Cost	0	0	109	138	Cont	TBD

(U) International Cooperative Agreements: Not Applicable

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207316F
PE Title: Tacit Rainbow
Project: # N/A
Budget Activity: #4-Tactical Programs

Project Title: Tacit Rainbow (AGM-136A) (U)



POPULAR NAME: Tacit Rainbow (TR) (U)

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands):

BUDGET	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
($000)					
Major Contract	13,395	28,932	N/A	N/A	N/A
Support Contract	2,202	0	N/A	N/A	N/A
In-House Support	2,465	3,163	N/A	N/A	N/A
GFE/ Other	6,766	4,334	N/A	N/A	N/A
Total	24,828	36,429	0	0	0
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	(To Complete)
Program Milestones	N/A	Program Closeout	N/A	N/A	N/A
Engineering Milestones	N/A	N/A	N/A	N/A	N/A
T&E Milestones	N/A	TBD	N/A	N/A	N/A
Contract Milestones	N/A	TBD	N/A	N/A	N/A

Program Element: #0207316F Project: # N/A
PE Title: Tacit Rainbow Budget Activity: #4-Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The Services have an urgent need for a low cost, programmable, loitering missile system that can search out and attack enemy radars operating in the 2-18 GHz range. The TR missile was intended to meet this requirement.for a viable emitter attack capability at a cost significantly less than other anti-radiation attack weapon systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Continued combined DT&E/IOT&E development program
   - (U) Conducted 9 flight tests
   - (U) Identified opportunity for expanded seeker capabilities

2. (U) FY 1991 Planned Program:
   - (U) Conduct tailored FSD completion with maximum technology extraction
   - (U) Complete truncated flight test program including free flights and acoustic captive carries

3. (U) FY 1992 Planned Program: Not Applicable

4. (U) FY 1993 Planned Program: Not Applicable

5. (U) Program to Completion: Not Applicable

D. (U) WORK PERFORMED BY: The Northrop Corporation (Newbury Park, CA) is the prime contractor for the air launch TR program. Northrop planned to produce this system in its new facility in Perry, GA. Northrop's major subcontractors include: Texas Instruments, Dallas, TX (seeker); Williams International, Walled Lake, MI (engine); and Delco, Goleta, CA (computer). The team of Raytheon/McDonnell Douglas/E-Systems was to be the second source producer for air launch TR as well as the full scale developer for the Army's ground launch system.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Not Applicable

2. (U) SCHEDULE CHANGES: The Air Force conducted an extensive program review and concluded that the program should be closed out. A close-out plan, including schedule, costs, and projected technology capture, is currently being prepared.

3. (U) COST CHANGES: Not Applicable

F. (U) PROGRAM DOCUMENTATION:

- (U) Joint Services Operational Requirements Document, Dec 88, (S)
- (U) Test and Evaluation Master Plan, May 90, (S)
- (U) Program Management Directive, Apr 89, (S)

Program Element: #0207316F
PE Title: Tacit Rainbow
Project: # N/A
Budget Activity: #4-Tactical Programs

G. (U) RELATED ACTIVITIES:

- (U) The Air Force is the Executive Service for air launch TR. Funding for Navy participation in full scale development is in PE #0207316N. The Navy has cancelled plans to procure production missiles.
- (U) The Army is the Executive Service for ground launch TR. The Army funded full scale development in PE #0207316A. The Army program is also being closed out.
- (U) No follow-on effort has been defined.

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

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
1. (S) Missile Procurement:						
(U) Funds	0	0	N/A	N/A	N/A	125,582
(S) Qty	0	0	N/A	N/A	N/A	0
2. (U) Aircraft Procurement (Launchers):						
(U) Funds	1,408	0	N/A	N/A	N/A	26,825
3. (U) Milcon:						
(U) Funds	0	0	N/A	N/A	N/A	5,600

I. (U) COOPERATIVE AGREEMENTS: Not Applicable

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
Contractor Development Testing	Mar 87 - Mar 89	2 out of 4 flights successful
DT&E Program	Mar 89 - Present	16 flights to date -- 7 successes, 7 partial successes, 2 failures

T&E ACTIVITY (TO COMPLETION)

Event	Planned Date	Remarks
Truncated Flight Test Program	Feb 91 - Apr 91	Key to closeout plan; first flight successful

FY 1992/1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207411F Budget Activity: #4 - Tactical Programs
PE Title: Overseas Air Weapon Control System

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2704 EIFEL Follow-On	1,339	2,126	2,156	0	0	30,746

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Elektronisches Information und Fuhrungsystem fur die Einsatzbereitschaft der Luftwaffe (EIFEL) system satisfies the requirement for an automated command and control system at the United States Air Force-operated Allied Tactical Operations Center (ATOC) in Sembach AB, GE. Under the EIFEL Follow-On (EFO) effort, the US Air Force will cooperate with the Federal Republic of Germany, Belgium, the Netherlands, and the United Kingdom in the joint development of a follow-on system to replace the current system (EIFEL I) fielded in the mid-1970s. In addition to replacing the EIFEL I system, improvements are being developed which will fully integrate the EFO system with other systems in the ATOC, leading to a more effective battle management capability for the ATOC Sembach Commander.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1992 AND FY 1993:

1. (U) Project 2704, EIFEL Follow-On:
Replacement of the EIFEL I system, full integration of command and control systems within the ATOC.

(U) FY 1990 Accomplishment:
- (U) Installed BS 2000 computer operating system - EIFEL I Lifetime Extension (EILE) Driver.

(U) FY 1991 Planned Program:
- (U) Continue software development, integration and testing.
- (U) Interface EILE with the Force Level Advanced Planning System (FLAPS).
- (U) Install EIFEL I Lifetime Extension.
- (U) Develop an interface between EIFEL and the Wing Command and Control System (WCCS).
- (U) Develop computer aided instruction training packages.

(U) FY 1992 Planned Program:
- (U) Simulation/connectivity to USAFE Warrior Preparation Center.
- (U) Install EFO, transition computer upgrade from EILE to EFO.
- (U) Interface EFO with FLAPS after computer upgrade is completed.
- (U) The EIFEL RDT&E portion of the program will be completed.

Program Element: #0207411F Budget Activity: #4 - Tactical Programs
PE Title: Overseas Air Weapon Control System

(U) FY 1993 Planned Program:
- (U) Program complete in FY92.

(U) Work Performed By: The Dornier Corporation (German) and its subcontractor, Computer Sciences International, Deutschland, are developing the EIFEL system software.

(U) Related Activities:
- (U) Program Element #0207415F, USAFE Command and Control System is developing the Wing Command and Control System.
- (U) Warrior Preparation Center Distributed Wargaming System (PE 0207411F) was developed by Defense Advanced Research Project Agency for interface with EFO program.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: A Memorandum of Understanding (MOU) between the United States and the Federal Republic of Germany was signed in June 1986 for the cooperative software development and implementation of the EIFEL Follow-On system. Under this agreement, total US contribution will not exceed 50 million Deutsch Marks. The MOU was supplemented in June 1988 to include the United Kingdom, Belgium, and the Netherlands. The accompanying Financial Agreements defines each nation's liability as a percentage of the total contract cost within the cap set by the MOU.

FY 1992/1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207412F Budget Activity: #4 - Tactical Programs
PE Title: Tactical Air Control System Improvements

A. (U) RESOURCES ($ in Thousands)
Project Title: TACS Improvements

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
TACSI	15,462	10,262	23,564	25,189	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The Tactical Air Control System (TACS) provides the means through which the Air Component Commander exercises control of his forces to accomplish his assigned mission. This program provides for major improvements to the existing TACS which was designed in the 1960s and is now unsupportable. The current TACS production programs include: 1) The Modular Control Equipment (MCE) program consists of a new transportable, modularized, software intensive, automated air command and control system. 2) The AN/TPS-75 Ultra Low Sidelobe Antenna (ULSA) is an Electronic Counter Counter-Measures (ECCM) program to enhance the survivability and capabilities of the AN/TPS-43E radar. 3) The Anti-Radiation Missile (ARM) Decoy is an ECCM program designed to protect the AN/TPS-75 radar. The Tactical Air Control System Improvements (TACSI) RDT&E program consists of MCE Pre-Planned Product Improvement (P3I). Due to funding cuts, the P3I program has been restructured into multi-block segments. Block A consists of the HAVE QUICK radio integration and the AN/TPS-75 radar interface already incorporated into the production line. Currently in R&D, Block B includes integration of Joint Tactical Information Distribution System (JTIDS), an Automated Air Tasking Order capability (AATO) upgrade to the satellite/troposcatter radio and digital interfaces, and secure anti-jam VHF radios. Block C includes interim JTIDS Message Standard (IJMS), USMC JTIDS Module (JM), and TADIL J reissue II.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Completed 90% of FSD hardware fabrication and integration testing of the first software release for MCE P3I.
   - (U) Awarded Anti-Radiation Missile (ARM) Decoy production contract.
   - (U) Awarded MCE production option.

2. (U) FY 1991 Planned Program:
   - (U) Complete MCE P3I hardware fabrication for Block B.
   - (U) Release MCE software Block B - version 3.

3. (U) FY 1992 Planned Program:
   - (U) Develop software for receipt of AATO, JTIDS class 2 terminals, and digital/secure communications upgrades.
   - (U) Incorporate secure, anti-jam VHF radios.
   - (U) Release final Block B software version.

Program Element: #0207412F Budget Activity: #4 - Tactical Programs
PE Title: Tactical Air Control System Improvements

3. (U) FY 1992 Planned Program (continued):
   - (U) Test Block B hardware and software.
   - (U) Start joint USAF/USMC Block C R&D software/firmware upgrades.

4. (U) FY 1993 Planned Program:
   - (U) Complete Block B hardware/software testing.
   - (U) Award Block B production contract.
   - (U) Develop initial Block C software. Block C software/firmware upgrades are: a separate JTIDS Module for USMC, develop IJMS for NATO AWACS and NATO Command and Control interface, starts the latest TADIL J software upgrade version 86++ for interface with other US C2 and tactical air defense platforms.
   - (U) Begin fabrication of USMC Block C hardware.

5. (U) Program to Completion:
   - (U) Complete Block B MCE P3I production.
   - (U) Release Block C P3I R&D software.
   - (U) Start and complete Block D P3I R&D and production.
   - (U) Block D R&D consists of simulation improvements, data reduction and recording, HAVE QUICK IIA integration, radar recording and playback, simulation improvements, and work toward defining anti-tactical ballistic missile defense requirements.

D. (U) WORK PERFORMED BY: The MCE P3I and Production contractor is Litton Data Systems at Van Nuys, CA. The ARM Decoy Production contractor is ITT Corporation at Van Nuys, CA. The AN/TPS-75 Production contractor is Westinghouse Corporation at Baltimore, MD.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: The MCE P3I R&D contract was restructured into Blocks due to funding cuts in FY90, FY91, and FY92. Restructuring will extend the various Blocks from 6 to 18 months.
3. (U) COST CHANGES: The FY91 ARM Decoy funds were exchanged with the FY92 AN/TPS-75 funds within the P-1 line. The exchange allows for better obligation of funds and provides for the purchase of an additional AN/TPS-75 radar, while still allowing the purchase of the same number of ARM Decoys in FY92. The funding cuts and subsequent restructure of the MCE P3I R&D program will add $5M - $10M to the cost of the program.

F. (U) PROGRAM DOCUMENTATION:
   - (U) Rome Air Development Center (RADC) TR-75-320, "Project SEEK SCREEN," July 1976 (S).
   - (U) TAF SON 316-80, "Improved Tactical Air Surveillance/Improved Tactical Air Control System", dated 17 Nov 80 (S)
   - (U) Amended TAF SON 316-80, 15 Jul 83.
   - (U) DCP for Modular Control Equipment (MCE), 10 Feb 87 (S).
   - (U) Joint TEMP, MCE, 1 Sep 89.

Program Element: #0207412F Budget Activity: #4 - Tactical Programs
PE Title: Tactical Air Control System Improvements

G. (U) RELATED ACTIVITIES:

- (U) Modular Control Equipment production is a joint USAF/USMC program (PE 0206626M). The MCE contract is administered by the Marines under a Memorandum of Agreement between the Navy and the Air Force. MCE P3I integrates the Joint Tactical Information Distribution System (JTIDS) terminals (PE 0604771D and 0604754F) and provides secure anti-jam VHF radios via the Single Channel Ground and Airborne Radio System (SINCGARS) (PE 0207423F).
- (U) $75M of the Air National Guard (ANG) FY91 funds will purchase 10 of the 21 MCE Production Operations Modules in FY91 along with their share of support costs.
- (U) $12M of ANG FY90 funds are being used to purchase 3 AN/TPS-75 production radars with their share of associated costs.
- (U) The Contigency TACS Automated Planning System (CTAPS) is managed by Tactical Air Command to provide upgraded shelters and automation to the Tactical Air Control Centers, Air Support Operations Centers, and Wing Operations Centers.
- (U) In conjunction with the development of USMC JTIDS capability within the Tactical Air Operations Module (TAOM) under Block C of MCE P3I, Marine Corp Research Development and Acquisition Command (MCRDAC) is developing through NAVALEXCEN Vallejo, CA the JTIDS Module (JM), and external shelter which will house the USMC JTIDS terminal, and the JTIDS Interface Box (JIB). The JM and JIB will be provided as government furnished equipment to Litton for integration with the MCE TAOM.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

(U) Procurement (BA 4):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY1993 Estimate	To Complete	Total Program
Cost	229,947	157,209	67,661	91,769	Cont	TBD
Quantities:						
Basic MCE	26	21*	0	0	0	80
ARM Decoy	2	0	14	0	0	16
AN/TPS-75	6	15*	3	0	0	60
MCE P3I Retrofit Kits	0	0	0	23	57	80
CTAPS	6	4	6	6	Cont	TBD
JTIDS Kits	0	0	0	11	Cont	TBD

* Includes ANG quantities; the funding line does not reflect ANG numbers.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE:

1. (U) Begin P3I in-plant Block B development testing Mar 1992
2. (U) Block B production decision Jun 1993
3. (U) P3I Production deliveries. 1996

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207417F
PE Title: Airborne Warning and Control System

Project: # N/A
Budget Activity: # 4-Tactical Programs

Project Title: Airborne Warning and Control System (AWACS)



POPULAR NAME: E-3 SENTRY

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Major Contracts	RSIP 56,238 30/35 30,662	60,345 31,784	114,338 61,671	57,469 44,932	TBD TBD
Support Contract	5,853	9,360	12,880	11,470	TBD
In-House Support	13,845	15,588	10,000	15,152	TBD
GFE/ Other	6,702	5,067	3,240	7,799	TBD
Total	113,300	122,144	202,129	136,822	TBD
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones			Block 30/35 Milestone 3		RSIP Milestone 3
Engineering Milestones	RSIP SDR 2/90 RSIP PDRs 8-12/90	RSIP CDRs 1-5/91			
T&E Milestones	RSIP BrassBd1 2-3/90	30/35 DT/OT 9/90-8/91 RSIP BrassBd2	RSIP Perform Demo	RSIP DT&E 1-4Q/93	RSIP IOT&E 4Q/93-1Q/94
Contract Milestones				Block 30/35 Prod Award	RSIP Prod Award FY94

Program Element: 0207417F
PE Title: Airborne Warning and Control System
Project Number: N/A
Budget Activity: 4-Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
This program develops and integrates system improvements which will enable the E-3 AWACS to remain an effective, survivable airborne surveillance system for command and control of tactical forces and for strategic defense of the United States. These improvements include Electronic Support Measures (ESM), central computer memory upgrade, and JTIDS Class 2H/TADIL J and NAVSTAR GPS terminal integrations (collectively known as Block 30/35); the Radar System Improvement Program (RSIP); and HAVE QUICK A-Nets. RSIP will restore required E-3 surveillance capability against the evolving threats posed by low radar cross section targets, and improve ECCM, reliability, and maintainability.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
- (U) Block 30/35 FSD continued with integration and checkout into the test aircraft/integration facilities. DT&E flight testing began.
- (U) RSIP FSD design activities continued with accomplishment of system design review. Brassboard flight testing successfully demonstrated increased sensitivity in non-elevation scan mode.
- (U) RSIP software prototyping was pursued by Ada consultant teams and the initial software bench was installed in the software development facility.
- (U) HAVE QUICK A-Nets production continued; initial kit installation began.

2. (U) FY 1991 Planned Program:
- (U) Block 30/35 FSD will continue, DT&E/IOT&E will be conducted on the modification kits, ESM integration and checkout will be completed, and US and NATO ESM flight testing will be accomplished.
- (U) RSIP FSD will continue. Software PDR and hardware and software CDRs will be accomplished. Hardware fabrication and software coding will begin.
- (U) The second segment of RSIP brassboard flight testing in elevation scan mode will be conducted.

3. (U) FY 1992 Planned Program:
- (U) The Block 30/35 Milestone III (production decision) will be made after completion of all DT&E/IOT&E and subsequent test results are available. Block 30/35 logistics support development will begin (deferred due to prior year adjustments). These efforts include maintenance support equipment development, Block 30/35 trial installation kits fabrication (required for initial training and to verify production fit), update of the E-3 Mission Simulator at Tinker AFB, OK and expansion of the ESM emitter library file.
- (U) RSIP FSD will significantly ramp up with the full build-up and factory acceptance testing of five prototype radar upgrade kits and spares. Software coding and testing will begin and completion of an RSIP performance milestone demonstration is planned. RSIP engineering testing in the avionics integration lab (AIL) and installation and checkout of the RSIP kit on the test aircraft will be accomplished.

Program Element: 0207417F | Project Number: N/A
PE Title: Airborne Warning and Control System | Budget Activity: 4-Tactical Programs

4. (U) FY 1993 Planned Program:
- (U) Block 30/35 logistics support development activities will continue. These efforts include support equipment development, trial installation kit integration, update of the E-3 Mission Simulator to the 30/35 baseline, and testing of the ESM emitter library file expansion. Block 30/35 production contracts will be awarded.
- (U) RSIP FSD will continue with 74 DT&E flight tests, reliability verification testing, maintainability demonstration, and software qualification scheduled.

5. (U) Program to completion: This is a continuing program.

D. (U) WORK PERFORMED BY: The Electronic Systems Division (ESD) at Hanscom AFB, MA manages the US program. ESD and the NATO Airborne Early Warning and Control (AEW&C) Program Management Agency (NAPMA), Brunssum, Netherlands, jointly manage the Electronic Support Measures (ESM) cooperative development program. The major contractors are the Boeing Aerospace Company, Seattle, WA (air vehicle and system integration & test); Westinghouse Electric Corporation, Baltimore, MD (radar); IBM, Owego, NY (Data Processor); and GEC Marconi, Little Falls, NJ (JTIDS).

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: None.
2. SCHEDULE CHANGES: Block 30/35 IOC date slips one year (Sep 94 to Sep 95) due to FY91 funding adjustment which deferred trial installation start.
3. COST CHANGES: FY90 funding was reduced $5.7M by Congress in FY90 Supplemental Appropriation. OSD reprogrammed $8.9M (+$5M FY89 and +$3.9M FY90) for RSIP FSD contract requirements in Aug 90. FY91 funding was reduced $11.6M by Congress ($8.8M) and undistributed AF cut ($2.8M). The FY92 (+$24M) and FY93 (+$35.2M) RDT&E budget increased to fund RSIP and Block 30/35 FSD shortfalls that were caused by FY89/90/91 adjustments. RSIP funds are for additional flight testing (towed sphere target support), reliablity verification hardware and testing, and depot development. Block 30/35 funds are for logistics support development required to field a supportable modification kit for US and NATO aircraft. Includes support equipment development and updates to trainers/simulators to the 30/35 baseline.

F. (U) PROGRAM DOCUMENTATION:

(U) ROC No: ADC/TAC-1-66 (S), 1 Sep 66
(U) DCP No. 5, Rev 4, E3-A (AWACS) Program (S), 6 Mar 80
(U) Block 30/35 Acquisition Plan 88-6 J&A 88-J&A-091, approved 10 Jan 89.
(U) USAF-NAPMO Cooperative R&D Agreement for E-3 ESM, 17 Nov 86
(U) SORD for E-3 RSIP, TAF(TAC 001-66)-I,II,III-A, 26 Sep 89.
(U) RSIP Acquisition Plan 89-AP-014, 7 May 89 and J&A 89-J&A-OA, 7 May 89

G. (U) RELATED ACTIVITIES:
(U) Development of the JTIDS Class 2H terminal required for the TADIL J is funded in PE 0604771D, Common JTIDS.

Program Element: 0207417F
PE Title: Airborne Warning and Control System
Project Number: N/A
Budget Activity: 4-Tactical Programs

(U) Development and integration of the Global Positioning System (GPS) user equipment is funded in PE 0305164F, Navstar GPS User Equipment.
(U) HAVE QUICK improvements are funded in PE 0207423F, Advanced Communications Systems.
(U) United Kingdom and France direct commercial E-3 purchases include, and are dependent upon, the USAF-developed E-3 integration of the JTIDS Class 2H/TADIL J terminal and central computer memory upgrade.
(U) Discussions continue on US participation in the NATO AEW&C Modernization Program, including NATO cooperative participation in RSIP.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ In Thousands)

1. (U) PROCUREMENT: Aircraft Procurement, Modifications

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY1993 Estimate	To Complete	Total Program
Cost	24,800	19,800	50,897	85,162	Cont.	TBD

2. (U) MILITARY CONSTRUCTION: Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: The United States and the North Atlantic Treaty Organization (NATO) are jointly developing and integrating a common ESM package for US and NATO E-3 aircraft. Total FSD cost is estimated at $150 million with NATO contributing a 35% share. An Addendum Multilateral MOU (MMOU) for NATO AEW&C Modernization was signed by all 12 nations on 7 Dec 90. This MMOU includes NATO participation in the RSIP program and other US E-3 improvements. Negotiations with NATO on a cooperative RSIP FSD MOA should begin in FY91. The UK has indicated that they are interested in joining RSIP in the production phase and the French are likely to make the same decision.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (Past 36 MONTHS)

Event	Date	Results
HAVE QUICK A-Nets IOT&E	Jan 1988	Successful
RSIP BrassBd Flt Testing 1	Feb-Mar 1990	Successful

T&E ACTIVITY (TO COMPLETION)

Event	Date	Remarks
ESM DT&E/IOT&E	Sep 1990-Aug 1991	On schedule
Block 30/35 DT&E/IOT&E	Sep 1990-Aug 1991	On schedule
RSIP BrassBd Flt Testing 2	2Q/FY91	
RSIP DT&E	1Q FY93-4Q FY93	
RSIP IOT&E	4Q FY93-1Q FY94	

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207419F Budget Activity: #4 - Tactical Programs
PE Title: Tactical Airborne Command and Control System

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
ABCCC Improvements - SATCOM						
	0	0	3,483	3,006	0	6,489
Total	0	0	3,483	3,006	0	6,489

B. (U) BRIEF DESCRIPTION OF ELEMENT: This PE includes two separate airborne command and control systems. The Airborne Battlefield Command and Control Center (ABCCC) provides rapid worldwide Command, Control, and Communications (C3) capabilities to the Air Force Component Commander (AFCC) or Joint Task Force (JTF) Commander, during combat or contingency operations. ABCCC not only extends ground based C3I capabilities but can function in a stand alone mode during the absence of ground based C^3I units. The ABCCC provides on scene tactical battle management for Tactical Air Forces. It can be a direct extension of the Tactical Air Control Center (TACC), an airborne Air Support Operations Center (ASOC), or the Air Component Commander's operations center. Current pre-planned product improvements (P^3I) consist of an upgrade to ABCCC Satellite communications (SATCOM) capabilities. This project continues the modernization and upgrade of ABCCC equipment to increase system capabilities and enhance compatibility and integration with other tactical control C3 systems; i.e., Airborne Warning and Control System (AWACS), TACC, ASOC, Joint Surveillance Target Attack Radar System (JSTARS), Modular Control Equipment (MCE), etc.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) ABCCC Improvements - SATCOM: ABCCC is tasked in ten separate OPLANS, of which, COMUSCENTAF OPLAN 1000-86 requires ABCCC to operate on three separate SATCOM nets. Other OPLANS require participation in two critical SATCOM nets with the availability of a back-up system. The SATCOM upgrade will enable ABCCC to meet the requirements for 3 JCS standard SATCOM systems per capsule, the JCS directed 5 KHz channelization capability, and maintain SATCOM interoperability with modified satellite nets. In addition to meeting JCS requirements, the ABCCC SATCOM upgrade will provide for voice and data communications on all narrow and wideband UHF SATCOM channels as well asproviding the additional capability of line-of-sight UHF communications. The upgrade will enable ABCCC to provide communications relay to, or over-the-horizon interface with National

Program Element: #0207419F Budget Activity: #4 - Tactical Programs
PE Title: Tactical Airborne Command and Control System

Command Authorities and other C^3I elements. Hardware, firmware and software upgrades along with design changes will fully integrate SATCOM and provide the capability for remote command and control of the SATCOM system from any on board battlestaff console and crewmember communications system. Upgrade will involve changes to the AN/ARC-187 control heads and associated modems.

(U) FY 1990 Accomplishments: Not Applicable.

(U) FY 1991 Planned Program: Not Applicable.

(U) FY 1992 Planned Program:
- (U) Award contract for hardware, firmware, and software upgrades to the ABCCC communications subsystems.
- (U) Complete initial hardware, software, and firmware design.

(U) FY 1993 Planned Program
- (U) Complete design effort.
- (U) Conduct system verification, validation and test.

(U) Work Performed By: All work will be done by UNISYS, St Paul, Minnesota and associated subcontractors.

(U) Related Activities:
(U) Program Element #0303605F, SATCOM Terminals
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense

(U) Other Appropriation Funds: ($ in thousands)
(U) Complete development of Group A SATCOM hardware, firmware and software.
(U) Complete one capsule with integrated Group A and B SATCOM

(U) Procurement (3010) (Class V Mods)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	0	0	0	1,416	4,892	6,308

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0207423F Budget Activity: #4 Tactical Programs
PE Title: Advanced Communication Systems

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2614 HAVE QUICK IIA SATURN	8,294	6,239	3,980	503	14,078	103,808
Total	8,294	6,239	3,980	503	14,078	103,808

B. (U) BRIEF DESCRIPTION OF ELEMENT:
The Air Force, Navy, and NATO rely chiefly on Ultra High Frequency (UHF) communications for combat operations. UHF anti-jam (AJ) protection is crucial to successful combat operations. This program funds development of the next generation interoperable UHF radio which will replace the AN/ARC-164 aircraft UHF radio. Twice, this radio has been upgraded to provide successively more robust AJ capabilities (HAVE QUICK I (1981-4) and HAVE QUICK II (1987-90)). But the AN/ARC-164 design dates from the early 1970s. The HAVE QUICK IIA program totally replaces the AN/ARC-164 with a redesigned radio, the AN/URC-126. It also adds an improved AJ and secure voice capability. The AN/URC-126 successfully completed DT&E in Apr 90 and will enter full rate production in FY 93. HAVE QUICK IIA has been accepted by NATO as the foundation for their long-term jam resistant voice communications called Second-generation Anti-jam Tactical UHF Radio for NATO (SATURN). The Standardization Agreement (STANAG) for SATURN was signed by the US in Nov 90 and is in international coordination. This program also funds development of remote crypto rekeying capabilities for ground UHF radio systems operated at remote sites. The other development tasks mentioned in the last Descriptive Summary have been cancelled.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) 2982, HAVE QUICK IIA SATURN: The HAVE QUICK IIA SATURN program replaces the AN/ARC-164 radio with the redesigned, improved anti-jam, secure voice AN/URC-126 radio. SATURN waveform interoperability changes, producibility improvements, and FOT&E will be accomplished in FY 1990-1993.

(U) FY 1990 Accomplishments:
- (U) The AN/URC-126 radio passed DT&E in Apr 90. Failure items from both failed DT&E in Apr 89 and failed IOT&E Jul 89 successfully addressed.

(U) FY 1991 Planned Program:
- (U) Issue RFP for SATURN waveform changes, producibility

Program Element: # 0207423F Budget Activity: #4 Tactical Programs
PE Title: Advanced Communication Systems

improvements, and first article test items for FOT&E of the AN/URC-126 radio.
- (U) Continue software support for the HAVE QUICK II radio.

(U) FY 1992 Planned Program:
- (U) Incorporate Navy and NATO interoperable SATURN software changes, accomplish AN/URC-126 producibility changes, and add an improved secure communications capability to the HAVE QUICK IIA radio.
- (U) Develop remote keying capability for ground HAVE QUICK II radios.
- (U) Continue software support for the HAVE QUICK II radios.

(U) FY 1993 Planned Program:
- (U) FOT&E with first article test radios for the AN/URC-126 scheduled for Dec 1992.
- (U) Continue software support for the HAVE QUICK II radio
- (U) Full rate production of AN/URC-126 to begin in 2Q FY 1993.
- (U) Delivery in 3Q FY 1994.

(U) Work Performed By: ESD/TGH, Hanscom AFB MA, has program management responsibility; Mitre Bedford MA provides systems engineering support; Magnavox Corp (Ft Wayne, IN), MACOM (Hauppage, NY), Motorola (Phoenix, AZ), and Rockwell-Collins (Cedar Rapids, IA) are prime contractors.

(U) Related Activities:
(U) Program Element 0207423A (SINCGARS)
(U) The Air Force will purchase an airborne SINCGARS capability for the Close Air Support F-16 aircraft under Program Element 0207133F (F-16 Squadrons)
(U) The Air Force will purchase ground SINCGARS radios from the Army.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):
(U) A/C Procurement (3010, P060 & P066 Other Aircraft).
(U) A/C Procurement (3010):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	22,700	3,000	2,500	26,779	218,900	273,900

(U) Other Procurement (3080, P0177 Antijam Voice)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
GRC-XXX HQ II Ground Radios	5,940	0	29,950	0	0	35,890

Program Element: # 0207423F Budget Activity: #4 Tactical Programs
PE Title: Advanced Communication Systems

SINCGARS
VHF Ground Radio

FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
0	4,802	2,500	2142	20,203	29,647

(U) International Cooperative Agreements: Not Applicable

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207590F
PE Title: SEEK EAGLE
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
4037 SEEK EAGLE Certifications	16,857	13,418	22,110	16,861	Cont	TBD
4038 SEEK EAGLE Technology Applications	1,000	1,000	6,900	15,500	Cont	TBD
Total	17,857	14,418	29,010	32,361	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Air Force has a variety of combat aircraft and a multitude of stores and store types (munitions, missiles, fuel tanks, electronic countermeasures pods, etc.). Aircraft can carry these stores in numerous loading configurations. Operational scenarios, missions, and tactics determine the required configurations and carriage and employment parameters. The loading configurations change as operational plans and tactics change, and new aircraft and stores are developed. Before operational use, the AF must certify these configurations for safe carriage and safe separation (jettison and normal release), and must verify ballistics accuracy under the user-specified carriage and employment parameters. The AF SEEK EAGLE program completes this certification through ground and flight testing, wind tunnel testing, and engineering analysis. There are over 900 configurations on the books at any one time. Depending on complexity, certifications can take from months to years. The certifications are carried out and funded under project 4037, SEEK EAGLE Certifications. The complexity of aircraft and stores and the technology associated with the SEEK EAGLE process have advanced over the last 10-15 years. But SEEK EAGLE has not had the resources to exploit and apply this technology. This, and the increasing workload have led to longer turnaround times and delays in fielding available combat capability. In fact, these delays were a major factor leading to an extensive SEEK EAGLE revitalization effort. As the revitalization effort strongly concluded, SEEK EAGLE is long overdue for the application of available technology. This technology will support a more efficient and cost effective SEEK EAGLE program. Project 4038, SEEK EAGLE Technology Applications, concentrates in three broad areas, i.e., instrumentation (airborne and ground), engineering analysis, and technical data base management. A modest investment in FY 1990 & 1991 allowed critical studies to be done and a comprehensive plan developed for full implementation starting in FY 1992. The technology projects will have "IOCs" beginning as early as FY 1992 and continuing through the out years, seeking a goal of reducing certification costs and time and improving the products delivered to the operational commands.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207590F
PE TITLE: SEEK EAGLE

Project Number: 4037
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands):

Project Title:

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
SEEK EAGLE Certifications						
	16,857	13,418	22,110	16,861	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Air Force SEEK EAGLE program certifies the safe carriage and release of every weapon and store configuration on Air Force and Foreign Military Sales (FMS) aircraft. SEEK EAGLE also verifies the accuracy of the weapons ballistics portion of the aircraft Operational Flight Program (OFP). Certification--safe carriage and release--is determined by engineering analysis, wind tunnel testing, and flight testing for compatibility, structural integrity, jettison and normal release, flutter, and stability and control. Ballistics accuracy verification requires analysis and flight testing to develop and verify data in the aircraft OFP for weapon delivery accuracy. SEEK EAGLE products include verified weapon delivery software for inclusion in the aircraft OFP and publications such as loading manuals, flight manuals, and delivery manuals--absolute essentials for operational use of aircraft and stores. SEEK EAGLE is a continuing program. New aircraft and stores are continually being developed, and new loading configurations and employment parameters arise due to changing operational requirements and tactics with weapons and aircraft already in the field. As of January 1991, there were 16 aircraft and 80 store types in work under SEEK EAGLE certification and/or accuracy verification. This, in turn, involved over 900 aircraft-store configurations in various stages of the process.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Conducted baseline certification of 21 conventional and 2 nuclear stores on the F-15E.
   - (U) Conducted B-52 certification of HAVE NAP, CBU-87/89, and BSU-85.
   - (U) Conducted F-16 certifications and/or ballistic accuracy verifications of 10 air-to-ground weapons and the AIM-120.
   - (U) Began certifications of 12 stores on the F-16C/D Block 40, and the AGM-65G on the F-16 and F-111F.

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Program Element: #0207590F
PE Title: SEEK EAGLE
Project Number: 4037
Budget Activity: #4 - Tactical Programs

2. (U) FY 1991 Planned Program:
   - (U) Conduct and accelerate efforts in support of Operation Desert Shield/Storm.
   - (U) Conduct UK 1000 pound bomb certification on the B-52 and TMU-28/B spray tank on the F-16 and F-15E.
   - (U) Begin AIM-120 certification with LAU-106A and LAU-128 launchers and AGM-65G on the F-15E.
   - (U) Continue MK 82/84, GBU-10/15, and CBU-87/89 efforts on the F-15E.
   - (U) Continue F-16C/D Block 40 certification on 12 stores.

3. (U) FY 1992 Planned Program:
   - (U) Conduct BLU-107 certification on F-111 at expanded flight limits.
   - (U) Complete F-16 Air Defense Fighter AIM-7/9/120 certifications.
   - (U) Complete AGM-130A certification on the F-15E and begin AGM-130C certification on the F-15E and F-111F.
   - (U) Complete AGM-65G and AIM-120 certification on the F-15E.
   - (U) Accomplish work on hundreds of other aircraft/store configurations in addition to these highlighted examples.

4. (U) FY 1993 Planned Program:
   - (U) Complete SRAM II certification on the B-1.
   - (U) Complete F-16C/D Block 40 and AIM-120 efforts.
   - (U) Complete CBU-97 certification for F-16 triple ejector rack use.
   - (U) Complete AGM-130C certification on the F-15E and F-111F.
   - (U) Accomplish work on hundreds of other aircraft/store configurations in addition to these highlighted examples.

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

D. (U) WORK PERFORMED BY: SEEK EAGLE work is performed both under contract with prime airframe contractors and through Air Force in-house engineering and test organizations. The AF SEEK EAGLE program is centrally managed by the AF SEEK EAGLE Office at Eglin AFB FL. Two of the prime contractors are General Dynamics, Ft Worth TX in support of the F-16 and McDonnell Douglas, St. Louis MO for the F-15E. Much of the work, however, is done in-house at such locations as the AF Development and Test Center, Eglin AFB FL; AF Flight Test Center, Edwards AFB CA; Ogden Air Logistics Center (ALC), Hill AFB UT; and AF Tactical Fighter Weapons Center, Nellis AFB NV.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Sensor Fuzed Weapon (SFW) certification cancelled on the A-7 and B-52.
3. (U) COST CHANGES: Other procurement and RDT&E funding associated with the A-7 and B-52 SFW certifications was deleted in FY 1993.

Program Element: #0207590F
PE Title: SEEK EAGLE
Project Number: 4037
Budget Activity: #4 - Tactical Programs

F. (U) PROGRAM DOCUMENTATION: Numerous certification requests from users such as SAC, TAC, MAC, AFSOC, and the AF Directorate of International Programs (HQ USAF/PRI) for FMS aircraft. The SEEK EAGLE program does not have its own SON or SORD; however, individual system SORDs contain early SEEK EAGLE requirements.

G. (U) RELATED ACTIVITIES:
- (U) SEEK EAGLE relates to, and must be in step with, programs such as the B-52, B-1B, F-111, F-15A/B/C/D, A-10, F-16, F-15E, F-4G, Advanced Medium Range Air to Air Missile (AMRAAM), and the various munitions acquisition programs.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

1. (U) PROCUREMENT:

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Missile Procurement/(BA 4, AMRAAM)						
Funds	4,667	0	0	0	Cont	TBD
Quantities	12*	0	0	0	Cont	TBD
Other Procurement/(BA 4, I-2000)						
Funds	0	0	38	0	Cont	TBD
Quantities	0	0	2	0	Cont	TBD
Other Procurement/(BA 4, MK 84)						
Funds	0	0	0	1,407	Cont	TBD
Quantities	0	0	0	734	Cont	TBD
Other Procurement/BA 4, SFW)						
Funds	0	0	12,947	5,817	Cont	TBD
Quantities	0	0	108	59	Cont	TBD

*The above quantities are incorporated in the program documents for the respective missile and munition programs, but are funded under SEEK EAGLE, PE 0207590F.

2. (U) MILITARY CONSTRUCTION: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE: Each of the SEEK EAGLE Requests from the AF operational commands or HQ USAF/PRI has a user need date. Key milestones such as engineering analysis, ground test, flight test, Operational Flight Program (OFP) update, and Technical Order (TO) publication are established for the roughly 900 requested loading configurations but are too numerous to list here. One example is the CBU-87 Combined Effects Munition on the F-15E. Flight testing will be completed in May 1992, with OFP fielding and TO publication in August 1992.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207590F
PE TITLE: SEEK EAGLE

Project Number: 4038
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands):

Project Title:

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
SEEK EAGLE Technology Applications						
	1,000	1,000	6,900	15,500	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Aircraft-stores certification (SEEK EAGLE) is the process the Air Force uses to certify weapon upload and download procedures; flight limits for safe carriage, employment, and jettison; and ballistics accuracy. The engineering analysis, wind tunnel, and flight testing can take several years, many stores, and extensive test range and wind tunnel time. Aircraft weapon systems have become more complex and difficult to analyze and test. Multiple warheads, guided weapons, and dispensary stores require increased ballistics analysis and flight test. Workload has also increased dramatically over the years while very little has been done to streamline and improve the stores certification process itself. Thus backlogs have developed and time and costs have increased for certifications. However, related technology has advanced and can be immediately applied to the certification process. The technology application program for SEEK EAGLE has a goal of reducing certification time in half in addition to reducing costs and significantly improving the quality of the product. The program will concentrate in three areas, i.e., improved simulation and engineering analysis, improved instrumentation (ground and airborne), and technical data base management. The program is structured to allow implementation of results beginning in FY 92 and incrementally throughout the FYDP. With improved analytical techniques, time consuming and costly flight testing can be significantly reduced, along with the expenditure of stores. A key to improving analysis is the application of computational fluid dynamics (CFD) to the analytical methods and models. Improved instrumentation will, among other things, reduce the time required to instrument test aircraft and improve and streamline test data gathering and reduction, thereby significantly increasing the throughput on flight testing. Developing and managing large technical data bases for stores certification is a time consuming and labor intensive effort. The accumulation and use of this data needs to be improved to enhance both the analysis and testing aspects of stores certification. The application of technology to the SEEK EAGLE process will cut the turnaround times from years to months and thus maximize the combat capability for the operational forces.

Program Element: #0207590F
PE Title: SEEK EAGLE
Project Number: 4038
Budget Activity: #4 - Tactical Programs

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Began integrated store separation and ballistics accuracy analysis task.
   - (U) Completed study for a computerized physical fit system for aircraft-store compatibility.
   - (U) Began development of applying computational fluid dynamics (CFD) techniques to the stores certification process.

2. (U) FY 1991 Planned Program:
   - (U) Continue work on the integrated store separation and ballistics accuracy analysis and modeling task. Develop techniques to use ground test data in the ballistics portion of the operational flight program development process.
   - (U) Begin development of a parametric approach to certifying stores on aircraft.
   - (U) Begin design of subsystem for airborne weapon test instrumentation.

3. (U) FY 1992 Planned Program:
   - (U) Continue integrated store separation and ballistics accuracy modeling task. Begin application of ballistic prediction capability to the SEEK EAGLE process. Complete the F-15 model with several stores. Derive CFD solutions for internally carried stores.
   - (U) Begin design study of stores certification information system.
   - (U) Apply CFD to loads analysis.
   - (U) Complete design of computerized physical fit.
   - (U) Above are highlighted examples from tasks within the 8 projects being pursued in FY 1992.

4. (U) FY 1993 Planned Program:
   - (U) Continue integrated store separation and ballistics analysis modeling task. Complete the F-16 model with several stores. Apply CFD solutions to stores separation and ballistics accuracy. Expand ballistics prediction capability.
   - (U) Complete design and produce drawings for "peel and stick" subminiature telemetry.
   - (U) Begin automation of data in the stores certification information system.
   - (U) Continue at the 8 project level in FY 1993. Above are highlighted examples from tasks within those projects.

Program Element: #0207590F
PE Title: SEEK EAGLE
Project Number: 4038
Budget Activity: #4 Tactical Programs

5. (U) Program to Completion:
   - (U) Complete CFD application to stores separation, ballistics, flutter, and dynamic response (FY 1994-98).
   - (U) Complete USAF stores certification information system and other airborne and ground instrumentation tasks (FY 1994-98).
   - (U) Fully implement the technology program results to the three main elements of stores certification, i.e., loading weapons, safely carrying weapons, and accurately delivering weapons.

D. (U) WORK PERFORMED BY: SEEK EAGLE modernization work is performed by Calspan, Tullahoma, TN; Harris Corp., Melbourne, FL; Orlando Technologies, Inc., Orlando, FL; Diversified Engineering Co., Richmond, VA; SCI Technology, Atlanta, GA; GRW Aerial Targets, Mobile, AL; Environmental Research Institute of Michigan, Ann Arbor, MI. The Air Force SEEK EAGLE Office at Eglin AFB, FL manages the modernization.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Scope expanded through additional projects in all three major areas, i.e., analysis, instrumentation, and technical data base management.
2. (U) SCHEDULE CHANGES: IOC dates now established for task outputs beginning in FY 1992. The technology application program will expand to eight projects in FY 1992 and FY 1993.
3. (U) COST CHANGES: RDT&E funds increased from $2M to $6.9M in FY 1992 and from $2M to $15.5 M in FY 1993 mainly to implement the program resulting from the exploratory and planning work of FY 1990/1991.

F. (U) PROGRAM DOCUMENTATION: Numerous certification requests from users such as SAC, TAC, MAC, AFSOC, and the AF Directorate of International Programs (HQ USAF/PRI) for FMS aircraft.

G. (U) RELATED ACTIVITIES:
   - (U) SEEK EAGLE modernization relates to, and is integrated with, PE 0604940D, Central Test and Evaluation Investment Program.
   - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ in thousands): Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE:
   1. (U) Complete Phase I (feasibility studies and initial development efforts): end FY 1992.
   2. (U) Complete Phase II (tasks based on current available technology): end FY 1993 through FY 1995.
   3. (U) Complete Phase III (tasks implementing advanced technology): end FY 1996 through FY 1998.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208006F Budget Activity: #4 - Tactical Programs
PE Title: Mission Planning System (MPS)

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990* Actual	FY 1991** Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3856 Tactical Air Forces (TAF) Mission Support System (MSS) II	1,885	0	0	0	Cont	TBD
3857 Conventional Mission Planning and Preparation System (CMPPS)	13,811	50	5,828	2,000	Cont	TBD
3858 Air Force Mission Support System (AFMSS)	1,101	7,910	7,605	12,999	Cont	TBD
Total	16,797	7,960	13,433	14,999	Cont	TBD

* FY 90 3857 funding includes 13.811M in PE 0101313F
** FY 91 3857 funding excludes 6.0M in a classified program element

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Mission Planning System (MPS) program enhances the Tactical Air Forces' (TAF) Mission Support System II (MSS II) via block upgrades to support conventional operations by tactical, strategic, airlift, and special operation (air) forces. In the near term, it supports the Conventional Mission Planning and Preparation System (CMPPS) and the TAF MSS II. The MPS program was created to preclude unnecessary duplication of effort and consolidate ongoing, fragmented mission planning development efforts by individual weapon programs. MPS will provide automated mission planning, intelligence, weather, weapons, electronic combat, and navigation information to aircraft and associated weapon systems. Automated interface with Theater, Command, and Joint data bases will be developed as well as the capability to load and read automated aircraft/weapon data systems cartridge units. Present mission planning capabilities are deficient in speed, storage capacity, software application, processing capability, flexibility, graphics, and automated combat mission folder preparation. Current mission planning systems also lack a near-real-time data input to provide current enemy threat information, and the capability to adequately process that data. Sortie rates, sophisticated avionics, first look and/or beyond visual range target destruction, and the ability to defeat complex threat systems requires an automated mission planning system and data input for current and future aircraft/weapons systems.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 3856, TAF MSS II: The purpose is to provide near term enhancements to the TAF MSS II, maximizing use of already fielded systems through specific upgrades designed to

Program Element: #0208006F Budget Activity: #4 - Tactical Programs
PE Title: Mission Planning Systems (MPS)

extend the operational life until fielding of AFMSS is completed. Present mission planning capabilities are deficient in speed, storage capacity, processing capability, flexibility, and graphics necessary to produce a combat mission folder.

(U) FY 1990 Accomplishments:
- (U) Data transfer device design deficiencies corrected providing mission planning capability for the F-15E and F-16
- (U) Released software update to support automated intelligence feed
- (U) MSS II IOC

(U) FY 1991 Planned Program:
- (U) Combine with Project 3858

(U) FY 1992 Planned Program:
- (U) None

(U) FY 1993 Planned Program:
- (U) None

2. (U) Project 3857, Conventional Mission Planning and Preparation System: The purpose is to update Strategic Air Command's (SAC) conventional mission planning system. Provides for near term enhancements of conventional mission planning activities for B-52 and related weapon systems. SAC B-52 aircrews cannot plan, program, and launch standoff weapons without CMPPS.

(U) FY 1990 Accomplishments:
- (U) CMPPS Tape 1 development supporting B-52 carrier functionality and gravity weapons
- (U) CMPPS Tape 2 development

(U) FY 1991 Planned Program:
- (U) Continue CMPPS Tape 2 development supporting "smart" conventional weapons
- (U) CMPPS Tape 1 delivery
- (U) Demonstrate operational capability of CMPPS Tape 1

(U) FY 1992 Planned Program:
- (U) CMPPS Tape 2 integration, test, and delivery
  - (U) 70% of FY 92 funds for integration efforts
    - (U) Integration and test of aircraft/weapon modules
    - (U) Write/modify lines of code
    - (U) Training
- (U) Defensive Data base delivery
  - (U) 30% of FY 92 funds data base upgrade
    - (U) Incorporates latest enemy threats

Program Element: #0208006F Budget Activity: #4 - Tactical Programs
PE Title: Mission Planning Systems (MPS)

(U) FY 1993 Planned Program:
- (U) Continued CMPPS Tape 2 integration and test

(U) Work Performed By: The Mission Planning System's development program is being managed by the Directorate for Battle Management, Electronic Systems Division, Hanscom AFB, MA. The MSS II contractor is Fairchild Communications and Electronics Company, Germantown MD. CMPPS contractors are Boeing Military Airplane of Wichita, Kansas and McDonnell Douglas of Omaha, Nebraska.

(U) Related Activities:
- (U) Program Element 0207133F, F-16 Squadrons, MSS I developed.
- (U) Program Element 0207128F, F-4 Squadrons, MSS II developed for F-4, F-15, and F-111 aircraft.
- (U) Program Element 0101113F, B-52 Squadrons, CMPPS developed.
- (U) There is no unnecessary duplication of effort in the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208006F Budget Activity: #4 - Tactical Programs
PE Title: Mission Planning System (MPS)

A. (U) RESOURCES ($ in Thousands):

Project Title Popular Name	FY 1990* Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Air Force Mission Support System (AFMSS)	1,101	7,910	7,605	12,999	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: AFMSS enhances Tactical Air Forces' (TAF) Mission Support System II (MSS II) via block upgrades to support conventional operations by tactical, strategic, airlift, and special operation (air) forces. It provides automated interface with Theater, Command, and Joint data bases; automated mission planning, intelligence, weather, weapons, electronic combat, and navigation information to aircraft and weapon systems; and loads and reads aircraft/weapon data transfer cartridge (DTC) units. Sortie rates, sophisticated avionics, first look and/or beyond visual range target destruction, and the ability to defeat complex threat systems requires an automated mission planning system and data input for current and future aircraft/weapons systems. Aircrews use AFMSS to minimize exposure to enemy threat radars during ingress/egress, preprogram communication/identification systems, initialize navigation systems, and program onboard weapons delivery/fire control computers. The success of a combat sortie is jeopardized without AFMSS to support mission planning requirements.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Released RFP for AFMSS Block upgrade
   - (U) Continued development of MSS II software

2. (U) FY 1991 Planned Program:
   - (U) Continue MSS II software improvements
   - (U) AFMSS Block A contract award
     - (U) Block A upgrade designed to meet *LANTIRN and other near term* requirements
   - (U) AFMSS Block B "Flyoff" contact award
     - (U) Block B fulfills Core mission planning requirements for all commands and TAF unique requirements
   - (U) AFMSS Block A modification starts
   - (U) Enhancement of mission planning software with modular architecture, improved user interface, and expanded mission planning capabilities for AFMSS Block B prototypes

Program Element: #0208006F Budget Activity: #4 - Tactical Programs
PE Title: Mission Planning Systems (MPS)

3. (U) FY 1992 Planned Program:
   - (U) Continuation of AFMSS Block B enhancement
   - (U) Integration of F-15/F-16 and MH-53J with the AFMSS Block B prototypes
   - (U) DT&E/Demonstration of AFMSS Block B capabilities
   - (U) AFMSS Block B downselect and contract award
   - (U) AFMSS Block B modification starts
   - (U) AFMSS Block C enhancement
     - (U) Fulfills MAC unique mission planning requirements
     - (U) Additional capabilities for SAC, TAF, and USSOCOM

4. (U) FY 1993 Planned Program:
   - (U) AFMSS Block B IOC
   - (U) Continue enhancement of AFMSS Block C software and MAC's one-man portable mission planning hardware
   - (U) Integration of additional weapon systems: B-52, C-130, MC-130, F-16 Block 50 etc.
     - (U) A 70% increase in FY 92 funding is needed to integrate additional aircraft and associated weapons systems on AFMSS

5. (U) Program to Completion:
   - (U) Complete AFMSS Block enhancement to satisfy MAC, SAC, and TAF requirements
   - (U) Complete AFMSS hardware deliveries

D. (U) Work Performed By: The Mission Planning System's enhancement program is managed by the Directorate for Battle Management, Electronic Systems Division, Hanscom AFB, MA. The Mission Support System II contractor is Fairchild Communications and Electronics Company, Germantown MD. Contractor(s) for AFMSS Block Upgrade TBD.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Priority for the MSS near term upgrade shifted to support the F-16 LANTIRN aircraft with emphasis on faster terrain perspective and radar predictions. This shift caused a delay in the release of the RFP and the IOC for the MSS upgrade. The schedule change had no funding impact on the program.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

- (U) SAC SON 13-87, SAC Mission Planning Systems, SECRET, Feb 1988
- (U) TAF SON 312-87, TAF Mission Support Systems, May 1988
- (U) MAC SON 07-88, MAC Mission Planning Systems, Jun 1989
- (U) TAF SORD 312-87-I-B, Air Force Mission Support System (MSS), Sep 1990

Program Element: #0208006F Budget Activity: #4 - Tactical Programs
PE Title: Mission Planning Systems (MPS)

G. (U) Related Activities:
- (U) Program Element 0207133F, F-16 Squadrons, MSS I developed.
- (U) Program Element 0207128F, F-4 Squadrons, MSS II developed for F-4, F-15, and F-111 aircraft.
- (U) There is no unnecessary duplication of effort in the Air Force or the Department of Defense.

H. (U) Other Appropriation Funds ($ in Thousands):

(U) Other procurement (PE0208006F):

	FY 90 Actual	FY 91 Estimate	FY 92 Estimate	FY 93 Estimate	To Complete	Total Progam
Cost	0	0	5,883	14,031	Cont	TBD
Qty	0	0	30	95	Cont	TBD

I. (U) International Cooperative Agreements: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1.	(U) AFMSS RFP	Sep 90
2.	(U) AFMSS Block A Contract Award	Apr 91
3.	(U) AFMSS Block B "Flyoff" Contract	Apr 91
4.	(U) AFMSS Block A IOC	Jun 91
5.	(U) AFMSS Block B Downselect	Jun 92
5.	(U) AFMSS Block B IOC	Oct 93

FY 1992/1993 BIENNIAL BUDGET RDT&E SUMMARY SHEET

Program Element: #0208010F Project Number: 2270
Title: Joint Tactical Communications Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Support and Integration (TRI-TAC)	3,059	4,602	6,709	13,424	0	338,946

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES:
The TRI-TAC program develops digital communications equipment for tactical operations. The Air Force needs to replace the aging and outdated equipment now in use with a secure, anti-jam communications network. Developments include transmission, switching, and system control equipment, local distribution equipment, terminal devices, and interface equipment. Significant slips and program cancellations to TRI-TAC due to budgetary constraints have increased the need to integrate more TRI-TAC capabilities into older generation equipment and to resolve interoperability and compatibility problems with TRI-TAC among other systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Initiated Tactical Communications Integration Program.
   - (U) Demonstrated Ku Band troposcatter radio production.
   - (U) Supported AF interoperability evaluations with Joint Tactical C^3 Agency.
   - (U) Started detailed investigations of TRI-TAC equipment into United States Air Force Europe/NATO systems.
   - (U) Concluded Phase I of joint tactical switch software development with Army.
   - (U) Planning initiated for resolving compatibility problem between Air Force TRI-TAC and Army Mobile Subscriber Equipment systems.

2. (U) FY 1991 Planned Program:
   - (U) Continue prior integration and software activities for TRI-TAC.
   - (U) Initiate detailed development planning to resolve data incompatibility problems.
   - (U) Continue developments to provide compatibility with Army mobile subscriber equipment program.
   - (U) Defer start of System Planning and Control System (SPCS) FSD to FY 92.

3. (U) FY 1992 Planned Program:
   - (U) Prior integration activities will continue for TRI-TAC.
   - (U) Support NATO communications restructuring now necessary within NATO.

Program Element: #0208010F Project Number: 2270
Title: Joint Tactical Communications Budget Activity: #4 - Tactical Programs

- (U) Develop multi-channel operational line evaluator (MOLE) for TSC-100A, TSC-94A, and TRC-170.
- (U) Start SPCS FSD, planned FY 93 completion.

4. (U) FY 1993 Planned Program:
   - (U) Complete TRI-TAC equipment integration.
   - (U) Document restructuring communications in support of NATO force reduction.
   - (U) Benchmark restructured communications requirements for future planning and integration efforts.
   - (U) Conclude TRI-TAC integration activities (Final year).
   - (U) Complete MOLE software development.
   - (U) Continue SPCS software development and testing.

5. (U) Program to Completion:
   - (U) TRI-TAC will be completed in FY 93.

D. (U) WORK PERFORMED BY: The Air Force Systems Command manages the Air Force portion of the program through the Electronic Systems Division, Hanscom AFB, MA. Contractors include: Raytheon Corp, Sudbury, MA, Unisys Corporation, Salt Lake City, UT, Troposcatter Radio; Sonicraft Corporation, Chicago Il, TAC-1 Fiber Optics Interface Unit, Analytical Systems Engineering Corporation, Burlington, MA and Mitre Corporation, Bedford, MA, Systems Engineering Support.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: SPCS FSD slipped from FY91 to FY92.
3. (U) COST CHANGES: AF review took $6M in FY 91, causing one year schedule slip in SPCS.

F. (U) PROGRAM DOCUMENTATION:
   - (U) PMD 5030(14)/33126F, 27 Feb 1990.

G. (U) RELATED ACTIVITIES:
   - (U) Conduct tasks identified by Services under overall direction of the Office of Assistant Secretary of Defense, Command, Control, and Communications and Intelligence, and the guidance of the Joint Tactical C^3 Agency, Ft Monmouth NJ.
   - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

Program Element: #0208010F Project Number: 2270
Title: Joint Tactical Communications Budget Activity: #4 - Tactical Programs

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands):
(U) Procurement (3080)(BA-83,P-1,Item 835100)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	78,754	45,768	67,914	85,386	TBD	TBD

(U) MILITARY CONSTRUCTION: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1. Start SPSC FSD	1st Qtr 92
2. Complete SPSC FSD	3rd Qtr 93
3. Field SPC	3rd Qtr 93

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208021F Budget Activity: 4 - Tactical Programs
PE Title: Electronic Combat Support

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
374 - C3 PROTECTION/MULTI-MISSION, TECHNOLOGY AND SUPPORT						
TOTAL	2,470	2,051	2,678	2,428	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program accomplishes studies and develops systems to provide warning, self-protection and support to personnel and equipment against electronic combat systems employed by enemy forces. It identifies existing research and development efforts which can satisfy unfulfilled operational requirements identified by the Unified and Specified (U&S) Commands, and it makes maximum use of current service lab developments to avoid duplication and quickly bridge the gap between technology development and operational requirements. The Secretary of Defense identified the need for this capability in 1983, and in 1986, with unanimous approval of services and U&S commands, JCS made the Systems Engineering (SE) function a permanent part of Joint Electronic Warfare Center (JEWC) mission. The Air Force, as the executive agent, is responsible for the total funding.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 374, C3 PROTECTION/MULTI-MISSION, TECHNOLOGY & SUPPORT: Develops engineering capabilities to match EW operational programs with quick, off-the-shelf existing technology.

(U) FY 1990 Accomplishments:
- ( )

- ( )

- (U) Army Communications ECM/ECCM Training System (ACETS). Follow-on to NETJAM (FY88) develops an ECM/ECCM training system that does not radiate actual signals. Testing scheduled for 3rd Qtr FY91.

Program Element: #0208021F Budget Activity: 4 - Tactical Programs
PE Title: Electronic Combat Support

- (U) EW Support for Low Intensity Conflict (LIC). Follow-on project of Marine Communications Countermeasures System (MCCS) Jammer (FY88) for 25th ID. Negotiations to purchase MCCS jammer for evaluation in LIC environment are on-going.
- (U)

- (U) Continued unfinished FY89 Projects.
  -- (U)

  -- (U)

  -- (U)

- (U) Continued unfinished FY88 projects
  — (U) Development of synthetic jamming system for naval ECCM training of communications operators (NETJAM) is completed with one prototype becoming operational at Barking Sands Range during 4th Qtr FY90.
  — (U) Continued development of VHF/UHF Hand Held Expendable Jammers (HEXJAM). Northrop and Loral have each delivered 11 prototypes. Joint evaluation and demonstration has been delayed due to Desert Storm.
  — (U) Marine Expeditionary Unit Special Operation Capable (MEUSOC) Jammer, renamed Marine Communications Countermeasures System (MCCS). Develops highly mobile UHF jammer for on the move jamming capability, prototype delivery scheduled for 1st Qtr FY91, with acceptance testing to follow.

(U) FY 1991 Planned Program:
- (U) Develop airborne communications/radar jamming training system based on ACETS (FY90) for the Air Force. Requirements refinement and contractor discussions on-going.
- (U)

- ( )

Program Element: #0208021F Budget Activity: 4 - Tactical Programs
PE Title: Electronic Combat Support

- (U)

- (U)

- (U)

- (U) Continue unfinished projects as required.

(U) FY 1992 Planned Programs:
- (U) Investigate technologies and develop prototypes to improve electronic warfare support measures (ESM).
- (U) Develop advanced electronic countermeasures (ECM) for use against more sophisticated future threat systems.
- (U)

- (U) Develop a frequency hopping capability for MCCS.
- (U) Continue ACETS development and testing.
- (U) Conduct airborne testing of the
- (U) Continue to investigate EW technologies to support Low Intensity Conflict (LIC).
- (U) Continue other unfinished projects as required.

(U) FY 1993 Planned Programs:
- (U) Investigate technologies and develop prototypes to improve electronic warfare support measures (ESM).
- (U) Develop methods to facilitate processing and I.D. of new complex threat emissions.
- (U) Develop advanced electronic countermeasures (ECM) for use against more sophisticated future threat systems.
- (U)

- (U) Continue to develop frequency hopping capability for MCCS.
- (U) Complete ACETS development and testing.
- (U) Continue airborne testing of the
- (U) Continue to investigate EW technologies to support Low Intensity Conflict (LIC).
- (U) Continue other unfinished projects as required.

(U) WORK PERFORMED BY: JEWC at Kelly AFB, Texas, performs independent studies and analysis leading to the development of engineering prototypes for field demonstrations/operations. When technology is available in service labs, JEWC arranges for the development of a prototype, and in conjunction with the developer, conducts testing and field demonstration. Service Laboratories the JEWC works with include the Pacific Missile Test Center, Point Mugu, California; the Naval Ocean

Program Element: #0208021F Budget Activity: 4 - Tactical Programs
PE Title: Electronic Combat Support

System Center, San Diego, California; and Air Force Logistics Command, Wright-Patterson AFB, Ohio. Where required technologies are not available within DOD, JEWC manages contractual efforts to produce, test, and demonstrate prototypes. JEWC currently has an engineering support contract with Northrop Defense Systems Division (NDSD) Department, Rolling Meadows, Il. Under JEWC management, NDSS performs engineering analysis, procures, fabricates, tests and demonstrates engineering models to satisfy CINC identified operational shortfalls.

(U) RELATED ACTIVITIES:
- (U) The JEWC SE program supports services and joint electronic combat (EC) programs.
- (U) Builds upon technology demonstrated in PE 0604270F, EW Development, and other Service's related PEs.
- (U) Technology development is related to that being developed in the following PEs.
  - -- (U) PE 0603711A, Aircraft Survivability Equipment.
  - -- (U) PE 0603718A, Vulnerability Susceptibility.
  - -- (U) PE 0603755A, Tactical ECM Systems.
  - -- (U) PE 0603214N, Tactical C3 Countermeasures.

(U) Other Appropriation Funds ($ in thousands): not applicable.

(U) International Cooperative Agreements: not applicable.

FY 1992/1992 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0301357F Project Number: #0001
PE Title: NUDET Detection System (NDS) Budget Activity: #3-Strategic Programs

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
001 Nuclear Detonation Detection System	12,362	1,478	1,494	1,548	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES
The National Command Authorities require a highly survivable capability to detect, locate, and report any nuclear detonation (NUDET) on a global basis in near real time. NUDET information supports post-impact selection of appropriate retaliatory options in response to a nuclear attack against North America, as well as strike confirmation, and damage assessment. The NUDET Detection System consists of sensors integrated on the operational Navstar Global Positioning System (GPS) satellites plus a user segment consisting of Ground/Airborne Integrated Terminals (G/AIT) and ground terminals. The NDS satellite payload consists of X-ray, optical and electromagnetic pulse (EMP) sensors. These sensors, when coupled with the extremely precise GPS timing capability, will provide location of nuclear bursts worldwide These data are crosslinked to other GPS/NDS satellites to provide worldwide connectivity. A broad range of users (National Command Authorities, Strategic Air Command, US Space Command, Federal Emergency Management Agency) receive NUDET data, direct from the spacecraft, on the precise location, yield, count, time, and height of burst.

This program element funds development/integration of the data crosslink and downlink and integration of sensors and NDS processors on the GPS spacecraft. This program complements PE 0102433F which develops and procures EMP sensors for GPS satellites and develops NDS ground terminal prototypes.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 001, Nuclear Detonation Detection System

(U) FY 1990 Accomplishments:
- (U) Continued development of NDS next generation optical and X-ray sensors.
- (U) Continued development of Block IIR NDS satellite crosslink and downlink systems. Critical Design Review completed in Sep 90.

Program Element: #0301357F Project Number: # 0001
PE Title: NUDET Detection System (NDS) Budget Activity: #3-Strategic Programs

(U) FY 1991 Planned Program
- (U) Continue engineering development of sensor integration design for GPS Block IIR satellites.
- (U) Qualify the Block IIR NDS satellite crosslink and downlink design.
- (U) Develop engineering solutions to any deficiencies identified during testing.

(U) FY 1992 Planned Program
- (U) Complete development and qualification of integrated NDS hardware systems into Block IIR spacecraft.
- (U) Complete the Block IIR NDS satellite crosslink and downlink system qualification.

(U) FY 1993 Planned Program
- (U) Complete design corrections to any deficiencies identified during test.

(U) WORK PERFORMED BY: System development and procurement is accomplished by Air Force Systems Command's Space Systems Division, Los Angeles AFB, CA

Rockwell International, Seal Beach, CA, integrates the NDS sensors on Block II GPS satellites and produces the EMP sensor for Block II satellites. General Electric, East Windsor, NJ will integrate NDS sensors on Block II replenishment satellites. Sandia National Laboratories, Albuquerque, NM, and Los Alamos National Laboratory, Los Alamos, NM, are under contract to the Department of Energy to produce the X-ray and optical nuclear detonation sensors. Texas Instruments, Dallas, TX, is developing the G/AIT. E-Systems, Garland, TX, is developing the EMP receiver/processor for the Block II satellites.

(U) RELATED ACTIVITIES:
(U) PE 0305165F, Navstar Global Positioning System (GPS) Space Segment.

(U) PE 0102433F, Integrated Operational NUDET Detection System (IONDS)
(U) PE 0302015F, NEACP/E-4B Class V
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) OTHER APPROPRIATION FUNDS ($ in Thousands)

(U) Missile Procurement (BA 27, P-44/45)

	FY 1990 Actual	FY 1991 Estimate	FY1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost						
Quantities			4	6		

(U) International Cooperative Agreements: None.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0302015F
PE Title: E-4B Nuclear Detonation Detection System Terminals
Project Number: #0001
Budget Activity: #3-Strategic Programs

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
001 E-4B Nuclear Detonation Detection System (NDS) Terminals	0	0	8,956	10,030	5,971	24,957

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The National Command Authorities require a highly survivable capability to detect, locate, and report any nuclear detonation (NUDET) on a global basis in near real time. NUDET information supports post-impact selection of appropriate retaliatory options in response to a nuclear attack against North America, as well as strike confirmation, and damage assessment. The NUDET Detection System consists of sensors integrated on the operational Navstar Global Positioning System (GPS) satellites plus a user segment consisting of Ground/Airborne Integrated Terminals (G/AIT) and ground terminals. These sensors, when coupled with the extremely precise GPS timing capability, will provide location of nuclear bursts worldwide These data are crosslinked to other GPS/NDS satellites to provide worldwide connectivity. This program element funds the development of necessary upgrades to existing G/AIT terminals to flight configuration for installation on the E-4B National Emergency Airborne Command Post. Also funds the upgrade of one of the G/AIT terminals. This new effort is consistent with the restructured NDS terminals program approved by Congress in FY91.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - Not applicable.

2. (U) FY 1991 Planned Program
   - Not applicable.

3. (U) FY 1992 Planned Program:
   - (U) Competitively award contract in 2Q FY92 to develop upgrades to existing G/AIT terminals.
   - (U) Procure required components to upgrade G/AIT mission processor.
   - (U) Begin software upgrades in G/AIT terminals to incorporate new E-4B interface requirements and improved NUDET confirmation algorithms.
   - (U) Begin airborne qualification of the Integrated Data Denial Unit (Crypto Box).

Program Element: #0302015F
PE Title: E-4B Nuclear Detonation Detection System Terminals
Project Number: #0001
Budget Activity: #3-Strategic Programs

4. (U) FY 1993 Planned Program:
   - (U) Complete qualification of the Integrated Data Denial Unit.
   - (U) Begin installation of upgraded mission processor into G/AIT terminal.
   - (U) Continue G/AIT software upgrades initiated in FY92.

5. (U) Program to Completion:
   - (U) Complete hardware upgrades and software modifications in FY94.
   - (U) Deliver upgraded G/AIT terminal.

D. (U) WORK PERFORMED BY: G/AIT development and upgrade is managed by Air Force Systems Command's Space Systems Division, Los Angeles AFB, CA with the assistance of Tinker AFB ALC, the System Program Manager for the E-4B. The contractor is yet to be determined for this effort. The contract will be competitively awarded.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

Not applicable.

F. (U) PROGRAM DOCUMENTATION:
   - (U) SORD, draft 1989.
   - (U) PMD 6112(12), 29 March 88

G. (U) RELATED ACTIVITIES:
   (U) PE 0305165F, Navstar Global Positioning System (GPS) Space Segment.
   (U) PE 0102433F, Integrated Operational NUDET Detection System (IONDS)
   (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands)
   Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE:

1. Award G/AIT Upgrade Contract	2Q FY92
2. Deliver first upgraded G/AIT	Nov 1994

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303110F
PE Title: Defense Satellite Communications System (DSCS)
Project Number: 0001
Budget Activity: #5 - Intelligence & Communications

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
DSCS	29,104	16,089	14,394	16,395	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: DSCS provides Super High Frequency (SHF) satellite communications for secure voice and high data rate transmissions. Provides unique and vital national security communications for worldwide military command and control, crisis management, relay of intelligence and early warning data, treaty monitoring and surveillance information, and diplomatic traffic. Specifically, DSCS supports the National Command Authorities, Worldwide Military Command and Control System, Diplomatic Telecommunications Service, White House Communications Agency, and mobile forces of all services.

Procures Integrated Apogee Boost Subsystem (IABS) which is required in order to launch DSCS on Atlas-II booster.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Delivered DSCS IIIB-13 satellite.
   - (U) IABS Propulsion Demonstration Model completed "Hot-Fire" tests.
   - (U) IABS Attitude Control Subsystem development testing completed.
   - (U) Linear Solid State Amplifier (LSSA) Critical Design Review completed.
   - (U) IABS Structural Development Model successfully completed testing.
   - (U) Qualification testing and initial acceptance test inspection of free-stretched IABS propellant tank successfully completed. Initiated IABS integration with DSCS III satellite.

2. (U) FY 1991 Planned Program:
   - (U) Launch two IABS-equipped DSCS satellites on ATLAS II booster.
   - (U) Deliver DSCS IIIB-14 satellite (last multiyear satellite) with IABS modifications for launch in FY 1991.
   - (U) Begin activation of two DSCS satellites for launch in FY 1992.
   - (U) Continue low level RDT&E of DSCS communications technology.
   - (U) Continue development and implementation of fixes and improvements to satellites in storage, prior to launch.
   - (U) Begin modification of existing facility for processing of DSCS satellites beginning with the fourth launch in FY 1992.

Program Element: #0303110F Project Number: 0001
PE Title: Defense Satellite Communications System (DSCS) Budget Activity: #5 - Intelligence & Communications

3. (U) FY 1992 Planned Program:
   - (U) Launch two IABS-equipped DSCS satellites on ATLAS II.
   - (U) Begin activation of two DSCS satellites for launch in FY 1993.
   - (U) Continue low level RDT&E of DSCS communications technology
   - (U) Continue development and implementation of fixes and improvements to satellites in storage, prior to launch.
   - (U) Incorporate solid state amplifiers on DSCS IIIB-10 for launch (Flight #4) in FY 1992.

4. (U) FY 1993 Planned Program:
   - (U) Launch two IABS-equipped DSCS satellites on ATLAS II.
   - (U) Begin activation of one DSCS satellite for launch in FY 1994.
   - (U) Prepare for FY 1995 SHF Replenishment Program. Preparation of Request for Proposal and system specification.
   - (U) Continue low level RDT&E of DSCS communications technology.
   - (U) Continue development and implementation of improvements (e.g., solid state amplifiers) and fixes to satellites in storage, prior to launch.

5. (U) Program to Completion:
   - (U) This is a continuing program. Continue launch of DSCS III satellites in storage using ATLAS-II/IABS through FY 1997.
   - (U) Initiate SHF Replenishment Program to procure eight satellites (1 RDT&E and 7 production satellites).
   - (U) Plan for EHF capability to provide high capacity/high data rate protected (wideband) service not existing or planned on any other satellite program.

D. (U) WORK PERFORMED BY: AF Space Systems Division, Los Angeles Air Force Base, CA is responsible for the space segment of DSCS. TRW, Redondo Beach, CA is the prime contractor for DSCS II. General Electric Co., Valley Forge, PA is the prime contractor for DSCS III. The Aerospace Corp., El Segundo, CA provides systems engineering and integration to the Satellite Communications (SATCOM) Program Office, Los Angeles AFB, CA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: DSCS III/ATLAS II Flight #5 delayed from First Quarter of FY 1993 to Third Quarter of FY 1993. DSCS III Flight #6 delayed from Third Quarter of FY 1993 to Fourth Quarter of FY 1993. Delay does not effect the RDT&E budget. The DSCS mission will not be compromised by this delay. FY 1993 Start of DSCS Replenishment Program delayed by two years as directed by OSD (PBD 172, Space Programs). This delay increases risk of coverage gaps as on-orbit assets age and/or fail prior to availability of replenishment.
3. (U) COST CHANGES: Reprogramming action in FY 1990 of $3.999 million. Due to difficulities in producing the IABS propellant tanks, the IABS development was stretched out thereby requiring the additional FY 1990 funding, and to preclude downstream production/yield problems an alternative tank design is being investigated. These additional

Program Element: #0303110F | Project Number: 0001
PE Title: Defense Satellite Communications System (DSCS) | Budget Activity: #5 - Intelligence & Communications

efforts will not effect the FY 1992 RDT&E budget. FY 1993 RDT&E funding reduction reflects schedule delay of DSCS Replenishment Program as directed by OSD.

F. (U) PROGRAM DOCUMENTATION:
- (U) DSCS Program Plan FY 1992-1996, October 1989.
- (U) DSCS Acquisition Program Baseline, 11 June 1989.
- (U) Mission Need Statement for Follow-On to DSCS validated by Joint Requirements Oversight Committee on 23 March 1990.
- (U) AFSPACECOM SON for Follow-On to DSCS, 25 May 1990.

G. (U) RELATED ACTIVITIES:
- (U) The Defense Communications Agency is responsible for overall program management, system engineering, and operational direction.
- (U) Program Element #0303142A, DSCS, Army ground terminal procurement.
- (U) Program Element #0303605F, Satellite Ground Terminals, The Air Force procures DSCS terminals, ground equipment, construction, operations and maintenance, and manpower support for its portion of the ground segment.
- (U) Program Element #0303109N, Satellite Communications System, Navy procurement of shipborne terminals.
- (U) Program Element #0305119F, Space Boosters, Air Force development and procurement of the ATLAS-II booster for launching DSCS satellites.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

- (U) Missile Procurement (BA 23, P-42):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	48,189	63,917	55,724	13,816	Cont	TBD

I. (U) International Cooperative Agreements: Signed "Memorandum of Understanding" (MOU) between US and United Kingdom on "Shared Use of DSCS Satellites by UK SKYNET Earth Terminals through January 1991", revised 4 January 1990. Similar MOU established with Iceland, 26 August 1990.

J. (U) MILESTONE SCHEDULE:

1. (U) Satellite Deliveries

DSCS III-B14		February 1991
SHF Replenishment		1st Qtr FY 2000

2. (U) Satellite Launches

DSCS III/ATLAS-II	FLT 1 - 2	FY 1991
	FLT 3 - 4	FY 1992
	FLT 5 - 6	FY 1993
	FLT 7	FY 1994
	FLT 8	FY 1995
	FLT 9	FY 1996
	FLT 10	FY 1997
SHF Replenishment	FLT 1	FY 2000

FY 1992/1993 BIENNIAL BUDGET RDT&E SUMMARY SHEET

Program Element: #0303126F Budget Activity: #5 - Communications and Intelligence
PE Title: Long Haul Communications

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

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2022 Automated Digital Communications Processing Techniques	1,447	1,319	2,575	2,654	Cont	TBD
2155 Systems Control	917	1,239	-0-	-0-	-0-	31.7
2157 Transmission Improvements	632	800	800	910	Cont	TBD
2206 Digital European Backbone	180	180	180	150	Cont	TBD
Total	3,176	3,538	3,555	3,714	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This RDT&E program defines system architectures, specifies design parameters, and develops communications technology for modernizing and improving communications networks, including the Defense Communications system (DCS). This program is the Air Force portion of the Tri-service RDT&E program for communications networks, including the DCS. The DCS provides the long distance, common user, and switched telecommunications networks to satisfy requirements of the National Command Authorities, the Department of Defense, and other government agencies.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project: 2022, Automated Digital Communications Processing: This project develops and tests systems designed to provide communications interoperability/survivability for long haul and local area networks to enhance command and control for tactical and strategic users of the DCS. Objectives are attained through a series of time-phased, related efforts in the areas of switching, routing, protocols and internetting communications network technologies. Efforts define architectures, specify design parameters, develop technology and performance specifications, produce initial models, perform tests and evaluate the resulting improvements to the DCS. A major part of the program is development of state-of-the-art technology to support the Defense Message System (DMS) Target Architecture and Implementation Strategy (TAIS). Continue development of the Communications Network Operating Systems (CNOS) experimental system model. To realize major savings in weight, volume, and financial investment the military must integrate the diverse information services required to fulfil its command and control mission. To this end, this project will leverage the tremendous investment by industry in Integrated Services Digital Network (ISDN) to implement integrated voice and data switching

Program Element: #0303126F Budget Activity: #5 - Communications and Intelligence
PE Title: Long Haul Communications

for the military; support the TAIS for phasing out disjointed military message switching by developing an AUTODIN to DDN interface (ADI); and develop the next generation distributed CNOS to provide integrated network management.

(U) FY 1990 Accomplishments:
- (U) Completed a X.400 protocol translation study for DMS services.
- (U) Completed software development of the DMS Automatic Digital Network (AUTODIN) Defense Interface (ADI).
- (U) Initiated implementation of DMS R&D test bed for ADI system.
- (U) Funded software for communications support processor (CSP) to provide Ada based message capability for Office of Secretary Defense (OSD).

(U) FY 1991 Planned Program:
- (U) Initiate Broadband ISDN architecture effort for Phase III of the DMS TAIS, slipped from FY 1990.
- (U) Evaluate experimental CNOS system model to demonstrate potential to operational systems.
- (U) Continue definition of ISDN architecture to support DMS.
- (U) Conduct ADI tests utilizing DMS R&D test bed.
- (U) Provide DMS ADI recommendations to Implementation Working Group.

(U) FY 1992 Planned Program:
- (U) Define final specifications for production ADI.
- (U) Complete CNOS II design and initiate hardware development (CNOS III).
- (U) Complete design of ISDN services for incorporation into the DMS.
- (U) Complete development of Machine Intelligent Technical Controller (MITEC) prototype and transition to AFCC & DCA. MITEC combined into Project 2022 from Project 2155 (closed out FY 91).

(U) FY 1993 Planned Program:
- (U) Continue Rome Air Development Center (RADC) DMS support.
- (U) Conduct preliminary testing of CNOS hardware.
- (U) Award contract to investigate International Policy-based interface for the DMS.
- (U) Plan for network management expert system.
- (U) Begin implementation of prototype automated intelligent system control.

(U) Work Performed By: RADC, Griffiss AFB, NY. Under contract to RADC are: Rome Research Corporation, Rome NY; Ford Aerospace and Communication Corporation, Colorado Springs, CO: Sterling Software Company, Bellevue, NE; Ford Aerospace Corporation, San Jose, CA; Stanford Telecommunications Incorporated, Reston VA.

Program Element: #0303126F Budget Activity: #5 - Communications and Intelligence
PE Title: Long Haul Communications

(U) Related Activities:
- (U) PE 603617F - C^3 Applications
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project: 2155, Systems Control:
This project improves DCS network management and control by developing techniques, hardware, and software to provide improved performance assessment, failure detection, failure isolation and reporting, and restoration and reconstitution on a worldwide basis. RADC is continuing development of the MITEC for near term application to the technical control facility problem domain. Work in this area is being expanded to investigate the applications of automated intelligent systems to other levels of the DCS control hierarchy. RADC is providing support to DCA in developing the Digital Patch and Access System (DPAS) control prototype, adaptive to wartime communications requirements and constraints.

(U) FY 1990 Accomplishments:
- (U) Conducted preliminary MITEC field test and continued development of MITEC system.
- (U) Identified functional requirements and locations for automated intelligent systems for integrated DCS control.
- (U) Provided technical support to DCA in development of DPAS control prototype.
- (U) Initiated MITEC/DPAS Network Control Interface effort.

(U) FY 1991 Planned Program:
- (U) Continue development of MITEC prototype, transfer to Project 2022 in Fy 92.
- (U) Begin development of prototype automated intelligence systems for integrated DCS control.
- (U) Continue investigating interface between DPAS Network Control prototype and MITEC.
- (U) Continue development of distributed Artificial Intelligence for communication network management.
- (U) Initiated Cooperative Intelligent Systems For Communication Network Management task under RADC Artificial Intelligence Program.
- (U) Project 2155 administratively combined with Project 2022.

(U) Work Performed By: RADC, Griffiss AFB, NY. Under contract to RADC are: Rome Research Corporation, Rome NY; Lincoln Labs, Lexington MA.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or Department of Defense.

Program Element: #0303126F Budget Activity: #5 - Communications and Intelligence
PE Title: Long Haul Communications

(U) Other Appropriation Funds: ($ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project: 2157, Transmission Improvements:
This project develops Long Haul Communications improvements and the necessary new capabilities needed for the next 20-30 years relevant to multichannel transmission communications used in the Air Force and DCS. These capabilities include but are not limited to Fiber Optics, Line of Sight Microwave, Troposcatter (TROPO), time division multiplexing, and issues related to compatibility and interoperability. This project explores deficiencies and problems in multichannel communications for not only fixed communications but mobile and the TRI-TAC organizations. The National Communications Systems (NCS) and the defense communities will benefit in the future.

(U) FY 1990 Accomplishments:
- (U) Completed test and evaluation of HF frequency hop modem which provides jam resistance, high data rates and improved voice recognition features.
- (U) Conducted acceptance tests on the meteor burst simulator installed at RADC.
- (U) Developed TRI-TAC/Common Carrier Applique exploratory development model to link military and commercial transmission links.

(U) FY 1991 Planned Program:
- (U) Initiate effort to add fiber optics to the Applique Unit and conduct acceptance tests.
- (U) Initiate design of Applique to allow TRI-TAC to operate over common carriers.
- (U) Initiate effort to expand voice capacity of existing systems such as Air Force Satellite Communication (AFSATCOM), Ground Wave Emergency Network (GWENS), and High Frequency (HF).

(U) FY 1992 Planned Program:
- (U) Complete design of Common Carrier/TRI-TAC Applique.
- (U) Initiate design of High Level Multiplex Interface between Digital European Backbone (DEB) and TRI-TAC.

(U) FY 1993 Planned Program:
- (U) Begin test of DEB/TRI-TAC interface.

(U) Work Performed By: RADC, Griffiss AFB, NY. Under contract to RADC are: Harris Corp., Melbourne, FL; Signatron Inc, Lexington, MA; Motorola, Scottsdale, AZ; and Raytheon, Sudbury, MA; National Communications Systems, Washington DC; Electronic Systems Division (ESD), Hanscom Air Force Base, MA.

Program Element: #0303126F Budget Activity: #5 - Communications and Intelligence
PE Title: Long Haul Communications

(U) Related Activities:
- (U) PE 0208010F - Joint Tactical Communications
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: ($ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project: 2206, Digital European Backbone (DEB):
DEB is the approved long-term program for digital upgrade of the Defense Communications system (DCS) in Europe. The program stems from the National Command Authority's direction to secure DCS links, the rapid growth of high speed data requirements, and major force deployments in Europe. One phase of DEB was completed in 1979. The remainder of DEB is planned to use the DCS standard digital radio and multiplex adapter equipment known as DRAMA. The first segment of DEB using DRAMA equipment became operational in June 1984. The remainder of the DEB upgrade will extend the improved operation from the Northern Atlantic to Italy, Spain and the United Kingdom. The Air Force is the lead military department for the overall upgrade.

(U) FY 1990 Accomplishments:
- (U) Continued site visits and surveys to activate the DCS installations located at sites in Great Britian, Germany, and Greece.

(U) FY 1991 Planned Program:
- (U) Maintain engineering to activate the DCS installations.

(U) FY 1992 Planned Program:
- (U) Maintain engineering to activate the DCS installations.

(U) FY 1993 Planned Program:
- (U) Maintain engineering to activate the DCS installations.

(U) WORK PERFORMED BY: RADC, Griffiss AFB, NY. ESD, Hanscom Air Force Base, MA. ESD receives technical support from the MITRE Corp., Bedford, MA; and Computer Engineering Associates, Avon, MA.

(U) RELATED ACTIVITIES: None.
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: ($ in Thousands)

(U) Procurement (3080)(BA-83, P-1, Item 837190)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	53,360	13,797	4,558	1,855	Cont	TBD

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303131F Budget Activity: #3 - Strategic Programs
PE Title: Minimum Essential Emergency Communications Network (MEECN)

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2834 Ground Wave Emergency Network (GWEN)/Dual Frequency MEECN Receiver (DFMR)	1,099	250	7,283	917	797	270,472
2832 Very low Frequency/Low Frequency (VLF/LF) Improvements	8,935	9,206	13,294	2,236	Cont	TBD
Total	10,034	9,456	20,577	3,153	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This element is the Air Force portion of a continuing program supporting the Chairman, Joint Chiefs of Staff, who is responsible for delivering the National Command Authority's decision in a precise and timely manner

MEECN Very Low Frequency/Low Frequency (VLF/LF) improvements project consists of communication systems specifically designed

The MEECN GWEN project provides a communications system specifically designed for

Communications in the VLF/LF region of the spectrum have attributes useful in strategic communications. These include low ambient propagation loss, significant penetration of sea water, and good performance in a nuclear environment. The program has a hard requirement for a funding increase from FY 1991 to FY 1992. Increased FY 1992 funding is required to support the first time integration of DFMR into a Minuteman site, completion of High Power Transmit Set (HPTS) installation design into EC-135 aircraft and completion of DT&E on EC-135 HPTS installation.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

(U) Project 2834, GWEN/Dual Frequency MEECN Receiver: This project defines, develops, tests, and deploys a proliferated ground wave communications system. This system provides U.S. strategic forces with the ability to maintain critical continental United States (CONUS) long-range command and control communications connectivity despite ionospheric disturbances caused by high altitude nuclear detonations. Survivability for this system is provided primarily by proliferated relay nodes. The Thin Line Connectivity Capability (TLCC) is the prototype network and interconnects national command centers, warning sites, and strategic bomber/tanker bases and contains 56 relay nodes. The follow-on phase, called the Final Operational Capability (FOC), expands the total number of relay nodes to 96 and adds additional users with a planned completion in the mid-1990's. Strategic force commanders and units (equipped with EMP-hardened, secure radio equipment) interact with nearby relay nodes for participation in the network. DFMR will provide the Strategic Air Command the ability to receive Higher Authority communications from the

Program Element: #0303131F Budget Activity: #3 - Strategic Programs
PE Title: Minimum Essential Emergency Communications Network (MEECN)

NCA via the JCS VLF/LF and GWEN LF systems. A portable DFMR will be developed for transport and rapid setup at SAC dispersal bases.

(U) FY 1990 Accomplishments:
- (U) Completed installation of 2 new GWEN Relay Nodes (RNs).
- (U) Continued GWEN site selection process for FOC.
- (U) Sponsored National Academy of Sciences (NAS) study on health effects of GWEN radio transmissions as required by Congress.

(U) FY 1991 Planned Program:
- (U) Conduct DFMR Critical Design Review and Test Readiness Review.
- (U) Initiate GWEN Airborne Input/Output production for EC-135.
- (U) Store hardware for 2 final nodes of TLCC and 40 FOC sites pending completion of NAS study on GWEN low frequency health effects. This delays program by one year and increases program costs by up to $17 million.

(U) FY 1992 Planned Program:
- (U) Deliver first GWEN Airborne Input/Output production unit.
- (U) Complete DFMR DT&E and initiate IOT&E.
- (U) Begin installation of remaining GWEN Relay Nodes for TLCC/FOC.
- (U) Integrate DFMR into a Minuteman site (first time integration).

(U) FY 1993 Planned Program:
- (U) Begin installation of DFMR units.
- (U) Completion of residual tasks is planned.

(U) Work Performed By: Air Force Systems Command's Electronic Systems Division, located at Hanscom AFB, MA, has managerial responsibility. Major GWEN contractors are General Electric, Camden, NJ and Contel, Fairfax, VA. DFMR prime contractor is Westinghouse Electric Corporation, Defense & Electronic Systems Division, Baltimore, MD. Mitre Corporation, Burlington, MA, and Analytical Systems Corporation (DFMR), Bedford, MA, provide system engineering support.

(U) Related Activities:
- (U) Program Element #0604312F, ICBM Modernization (Rail Garrison), provides additional RDT&E FY 90/91 funding for completion of Dual Frequency MEECN Receiver development and FY 92/93 DFMR production funding.
- (U) Program Element #0101312F, PACCS/WWABNCP System EC-135 Class V Modifications, provides funds for the GWEN Airborne units.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):

- (U) Other Procurement (BA 83):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	7,358	2,435	1,221	1,493	24,634	115,328

Initial spares funding provided in FY 1991-1993.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303131F
PE Title: Minimum Essential Emergency Communications Network (MEECN)
Project Number: 2832
Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Very Low Frequency/Low Frequency (VLF/LF) Improvements	8,935	9,206	13,294	2,236	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
Project consists of improvements to our VLF/LF communications system to extend range, improve resistance to jamming and nuclear effects, and increase message accuracy at all ranges. It includes adding VLF/LF receivers in B-1B and B-52H aircraft [Miniature Receive Terminal (MRT)], improving VLF/LF transmission with an enhanced power (100 KW) transmitter and improved trailing wire antenna on EC-135 and E-4B airborne command post aircraft [High Power Transmit System (HPTS)], and development of VLF/LF improved transmitters [Diversity Reception Equipment (DRE)]. It includes continuing assessment of enhancements and improvements in the VLF/LF communications area.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Completed Laboratory tests of HPTS Engineering Development Models (EDMs) and test procedures developed for IOT&E.
   - (U) Initiated MRT production of 136 airborne units and 48 Transfer Module Service Station units; completed production line buy-out.
   - (U) Fifteen MRT airborne units delivered and installed at 28th Ballistic Missile Wing, Ellsworth AFB, SD.
   - (U) CINCSAC declared Initial Operational Capability (IOC) for MRT on 2 Aug 1990.
   - (U) DRE initial development program completed.

2. (U) FY 1991 Planned Program:
   - (U) Initiate HPTS Installation Design (Phase II) for EC-135 aircraft.
   - (U) Initiate improved 200 KW HPTS evaluation.
   - (U) Initiate delivery and installation of B-1B MRT production assets.
   - (U) Complete MRT Field Reliability Growth Test.
   - (U) Initiate MRT Depot activation.
   - (U) Complete delivery of MRT Depot support equipment.

3. (U) FY 1992 Planned Program:
   - (U) Complete improved 200 KW HPTS evaluation for E-4B.
   - (U) Initiate MRT Program Management Responsibility Transfer to WR-ALC.
   - (U) Complete delivery of MRT production assets.
   - (U) Complete HPTS Installation Design and DT&E for EC-135 aircraft.
   - (U) Initiate IOT&E for EC-135 HPTS system.

Program Element: #0303131F | Project Number: 2832
PE Title: Minimum Essential Emergency Communications Network (MEECN) | Budget Activity: #3 -Strategic Programs

4. (U) FY 1993 Planned Program:
   - (U) Air Force support to on-going MEECN improvements continues and includes support for interoperability testing, threat studies, new VLF/LF modes and VLF/LF system improvements.
   - (U) Complete EC-135 HPTS IOT&E.

5. (U) Program to Completion:
   - (U) This is a continuing program. WR-ALC, Robins AFB, GA, will manage the MRT program.

D. (U) WORK PERFORMED BY: Rockwell International, Richardson, TX (MRT and HPTS); Sonicraft Incorporated, Chicago, IL (DRE); Analytical Systems Engineering Corporation, Burlington, MA; Mitre Corporation, Bedford, MA; and Dual and Associates, Arlington, VA. Air Force Systems Command's Electronic Systems Division, located at Hanscom AFB, MA, has managerial responsibility for the described programs, except for the HPTS program for which the Navy's Naval Airborne Strategic Communications Program Office, PMA-271, Crystal City, VA has primary responsibility.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Delays in B-1B FOC (TBD to FY 94) and B-52H FOC (FY 96 to FY 97) were a result of both contract award delay and adjustments to the aircraft programmed depot maintenance schedules. HPTS FSD delay in delivery of first engineering development models (Group B kit) from 2nd Qtr FY 89 to 2nd Qtr FY 90 is result of contractor delays. EC-135 IOT&E slip due to contractor delays and safety issues on installation (Group A kit) design. Stopped work on installation design; contract negotiations ongoing for a Phase II effort covering installation and test of HPTS on EC-135 aircraft.
3. (U) COST CHANGES: Project funding increase from FY 1991 to FY 1992 required for completion of installation design of HPTS on EC-135 aircraft, completion of DT&E on this installation design and to initiate IOT&E of HPTS on the EC-135. FY 1991 increases are a result of HPTS schedule slip and a FY 1991 additional reprogramming of $4.0 million will be required to cover the EC-135 FSD Phase II effort. Final contractor estimates are expected by early Feb 1991 (current estimate is between $15-17 million to complete this Phase II effort).

F. (U) PROGRAM DOCUMENTATION:
   - (U) SAC ROC 7-71, 22 Apr 1971.
   - (U) MROC 2-80, 3 Feb 1983.
   - (U) MROC 18-83, 31 Aug 1983.
   - (U) MRT TEMP, 1 Mar 1986.
   - (U) Navy/Air Force Memorandum of Agreement, Jun 1986.

G. (U) RELATED ACTIVITIES:
   - (U) Program Element #0101312F, PACCS/WWABNCP System EC-135 Class V Modifications, contains funding for HPTS aircraft modifications.

Program Element: #0303131F
PE Title: Minimum Essential Emergency Communications Network (MEECN)
Project Number: 2832
Budget Activity: #3 -Strategic Programs

- (U) Program Element #0101402N, HPTS Program, Joint development program with Navy as the lead service. A Memorandum of Agreement is maintained at the Assistant Secretaries of the Air Force and Navy level.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

- (U) Aircraft Procurement (BA 5): Class V Mods

(B-1B MRT)	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	1,200	-	-	-	-	71,530

(B-52H MRT)	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	26,371	259	68	13,245	934	42,722

I. (U) International Cooperative Agreements: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1. (U) MRT Milestones

Production Contract Award	Aug 1989
Depot Activation	Oct 1991
PMRT to WR-ALC	Dec 1991
B-1B FOC	FY 1994
B-52H FOC	FY 1997

2. (U) HPTS Milestones

Delivery of first engineering development models	2nd Qtr FY 1990
EC-135 IOT&E	3rd Qtr FY 1993

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303144F
PE Title: Electromagnetic Compatibility Analysis Center (ECAC)
Budget Activity: #5 - Intelligence & Communications

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Electromagnetic Compatibility Analysis Center (ECAC)	8,152	7,917	10,133	10,933	Cont	TBD
Total	8,152	7,917	10,133	10,933	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
ECAC is a Joint DOD Center operating IAW with DOD Directive 3222.3. Policy and program direction are provided jointly by the Chairman, Joint Chiefs of Staff (JCS), and the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (ASD/C3I). The Air Force is designated as the administrative agent for ECAC with the responsibility to program, budget, and finance the Joint Program. The Air Force provides both RDT&E and O&M funds under Program Element 0303144F. Failure to develop electromagnetically compatible C-E systems will result in operation degradation, leading to loss of aircraft, premature detonation of explosives, or loss of command, control, and other vital functions. The function of the Center is to ensure that the Air Force and other Services design, develop, and acquire communications-electronics (C-E) equipment (e.g., JTIDS, MILSTAR, AWACS), supporting C3I and electronic warfare (EW), that will operate compatibly with other systems in strategic or tactical operations. This program provides the technical data for use in analysis of over 200 DOD programs supported by ECAC. To assure the compatibility operation of C-E systems in their intended operational environment, the ECAC provides support to system acquisition program management officers, operational commanders, and frequency managers on a cost reimbursement basis. Specific projects for which the Center is responsible include the Frequency Resource Record System (FRRS), Operational Planning, and C-E Systems Acquisition Support. The ECAC developed/maintained FRRS is managed by JCS and is required by frequency management components of the Air Force and other Services, and CINCs worldwide. The program is required to guarantee optimum use of frequency authorization assets worldwide. ECAC Operational Planning support provides Service, JCS, and CINC planners with descriptives of the C-E infrastructure for countries and regions specified by JCS. C-E Systems Acquisition support provides Air Force and other Service system acquisition managers with frequency supportability and electromagnetic support during the development, procurement, and deployment of C-E systems.

Program Element: #0303144F Budget Activity: #5 - Intelligence & Communications
PE Title: Electromagnetic Compatibility Analysis Center (ECAC)

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY

1. (U) TECHNICAL CHANGES: None

2. (U) SCHEDULE CHANGES: DESERT SHIELD/STORM Operational Planning Support impacted ECAC ability to maintain the FRRS and C-E System Acquisition Support Schedules.

3. (U) COST CHANGES: FY 1991 20% funding cut to planned program delayed availability of improved tools to operational units; delayed upgrade of database system for reduced software maintenance costs, increased accessibility of data and models, and greater productivity; delayed environmental data bases updates; delayed FRRS hardware upgrades for improved system performance; and delayed software developments for inclusion of equipment technical characteristics and host nation data.

F. (U) PROGRAM DOCUMENTATION:
(U) ECAC operated IAW DOD Directive 3222.3.

G. (U) Related Activities: ECAC supports JCS, DOD, and other Service requirements. There is no unnecessary duplication of effort.

H. (U) Other Appropriation Funds ($ in Thousands):
(U) Operations and Maintenance:

FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3,228	5,616	6,707	6,725	Cont	TBD

I. (U) International Cooperative Agreements: None.

J. (U) MILESTONE SCHEDULE:

1.	(U)	Completed JUST CAUSE Support	Dec 1990
2.	(U)	Installed Battlefield HF AS at CINCPAC	Mar 1990
3.	(U)	Started DESERT SHIELD Support	Aug 1990
4.	(U)	Completed interface with NSA SOI	Sep 1990
5.	(U)	Extended FRRS to CINCEUR, Japan, Korea	Sep 1990
6.	(U)	Started DESERT STORM Support	Jan 1991
7.	(U)	Connect to DODIIS	Sep 1991
8.	(U)	Interface FRRS with host government data	Sep 1992
9.	(U)	Initiate ECAC contingency planning support cell	Sep 1992
10.	(U)	Develop interfaces to integrate Service developed BSMS and the FRRS.	Sep 1992
11.	(U)	Add artificial intelligence/expert systems to the FRRS.	Sep 1993
12.	(U)	Complete development and fielding of operational JSMS to CINCS.	Sep 1993

Program Element: #0303144F Budget Activity: #5 - Intelligence & Communications
PE Title: Electromagnetic Compatibility Analysis Center (ECAC)

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Documented the frequency management infrastructure of eight countries as identified by the Joint Staff.
   - (U) Supported JUST CAUSE and DESERT SHIELD with frequency and communications planning support per Joint Staff direction.
   - (U) Extended FRRS network to CINCEUR, Japan, and Korea.
   - (U) Completed software to interface the EW Deconfliction System with NSA generated Signal Operating Instructions (SOI).
   - (U) Installed Battlefield HF Assignment System at CINCPAC for T&E.
   - (U) Managed/maintained/operated the FRRS and the DOD EMC Data Base.
   - (U) Note: The FY 91 program was cut from the original request of $9.637M to $7.917M.

2. (U) FY 1991 Planned Program:
   - (U) Support DESERT SHIELD/STORM with frequency management and communications planning support.
   - (U) Connect to DOD Intelligence Information System (DODIIS).
   - (U) Integrate host nation data formats into the FRRS.
   - (U) Establish the FRRS configuration control board.
   - (U) Add frequency allocation evaluation capability to the FRRS.
   - (U) Manage/maintain/operate the FRRS and the DOD EMC Data Base.
   - (U) Evaluate interface between Joint Spectrum Management System (JSMS) and the FRRS.
   - (U) Note: The apparent ramp in this Descriptive Summary from FY 91 $7.917M to FY 92 $10.133M is actually a cut from the original FY 91 estimate.

3. (U) FY 1992 Planned Program:
   - (U) Develop interface between FRRS with host government data.
   - (U) Manage/maintain/operate the FRRS and the DOD EMC Data Base.
   - (U) Initiate ECAC contingency planning support cell.
   - (U) Develop interfaces to integrate the Management Systems (JSMS) and the FRRS Service developed Battlefield Joint Spectrum.

4. (U) FY 1993 Planned Program:
   - (U) Add artificial intelligence/expert systems to the FRRS.
   - (U) Complete development and fielding of operational JSMS to CINCS.
   - (U) Manage/maintain/operate the FRRS and the DOD EMC Data Base.

5. (U) PROGRAM TO COMPLETION:
   - (U) This is a continuing program. PE 0303144F provides institutional funding for ECAC.

D. (U) Work Performed by: The IIT Research Institute at Annapolis, MD, under contract through the Electronic Systems Division (ESD), Air Force Systems Command (AFSC). Contractual effort is managed by ECAC technical staff.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303152F Budget Activity: 3- Strategic Programs
PE Title: WWMCCS Information System

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3155 USAF WWMCCS ADP Modernization (AFWAM) Program						
	3.351	1.504	816	0	0	23.649
Total	3,351	1,504	816	0	0	23,649

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Air Force Worldwide Military Command and Control System (WWMCCS) ADP Modernization (AFWAM) program implements the Joint WWMCCS modernization program at Air Force WWMCCS sites. RDT&E funds are used to identify interface standards required to continue present integration of Air Force standard C2 software applications with modernized Joint applications, and to design local area network (LAN) installations.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 3155, USAF WWMCCS ADP Modernization (AFWAM) Program: Implements Joint WAM Program at Air Force sites.

(U) FY 1990 Accomplishments:
- (U) Began installation of local area networks at 2 sites and installed 600 workstations at AF operational sites
- (U) Determined site requirements for the implementation of the joint application software and began upgrade to present host processors
- (U) Continued work on Model Site Program, identifying interface requirements between Joint and MAJCOM-level C2 applications

(U) FY 1991 Planned Program:
- (U) Continue installation of local area networks and workstations at AF operational sites.
- (U) Continue integration efforts between Joint and Air Force software systems.

(U) FY 1992 Planned Program:
- (U) Continue installation of workstations at AF operational sites.
- (U) Complete installation of LANs at AF operational sites.
- (U) Continue integration efforts between Joint and Air Force software systems.
- (U) Begin plans for integration of data base machines at Air Force WWMCCS sites.

Program Element: #0303152F Budget Activity: 3- Strategic Programs
PE Title: WWMCCS Information System

(U) FY 1993 Planned Program:
- N/A

(U) Work Performed By: Air Force Systems Command, Electronic Systems Division, Hanscom AFB, MA. Contractor support provided by MITRE and CEA of Billerica, MA.

(U) Related Activities:
- (U) Program Element #0303154K, WWMCCS ADP Modernization (WAM) Program run by the Defense Communications Agency.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: ($ in Thousands)

Other Procurement (BA):

FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
14,631	6,638	5,790	21,545	Cont.	TBD

(U) International Cooperative Agreements: Not applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303401F Budget Activity: 5-Intelligence & Communications
PE Title: Communications Security (COMSEC) RDT&E

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Communications Security	5,316	5,845			Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The Air Force Research and Development (R&D) portion of the overall Department of Defense (DOD) COMSEC program addresses problems encountered in adapting general purpose cryptographic equipment for use in new Air Force communications and computer systems. The efforts are primarily directed at insuring that all systems being developed by the Air Force meet current national communication security requirements. The program develops ancillary systems such as voice digitizers, COMSEC equipment adapter units, and, with National Security Agency (NSA) development authority, integrated COMSEC systems to meet specific Air Force command, control, communication, and intelligence (C3I) requirements.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Broad-band antennas for the time domain collection system were upgraded to full 20GHz range.
   - (U) A COMSEC Custodial software package was completed, operationally evaluated, and procurement specifications prepared.
   - (U) Digital-digital tandeming of wide-band and narrow-band secure voice systems at a Gateway was demonstrated using the canonical transform.
   - (U) Began transition of Blacker technology to operational sites.
   - (U) Began development of Multilevel Security (MLS) Guard.

2. (U) FY 1991 Planned Program:
   - (U) Complete development of a broad-band time domain collection system.
   - (U) Develop a wideband digital recording system.
   - (U) Continued development and delivery of a Computer Assisted Analysis System (CAAS) for TEMPEST testing.
   - (U) Deliver Tier Two of the Air Force Electronic Key Distribution System (AFEKDS).
   - (U) Field demonstrate high quality secure voice tandeming among systems using canonical domain digital speech technology.
   - (U) Continue development of Multilevel Security Guard to ensure computer data is protected from unauthorized users.

Program Element: #0303401F Budget Activity: 5-Intelligence & Communications
PE Title: Communications Security (COMSEC) RDT&E

- (U) Continue TEMPEST, COMSEC and secure voice research and development to ensure Air Force fielded systems are capable of countering exploitation efforts.

3. (U) FY 1992 Planned Program:
   - (U) Continue development of Multilevel Security (MLS) system products (including Guard) and technology required to secure ground, air, and space based weapon platforms.
   - (U) Complete the Full Scale Development of Data Detection and Sanitation technology and products.
   - (U) Continue development on 25 individual technology plans for execution in: advanced computer penetration methods and countermeasures, security technology for distributed/ parallel computer systems, high speed encryption, and advanced technical security signal intercept and processing technology.

4. (U) FY 1993 Planned Program:
   - (U) Continue development of Multilevel Security (MLS) products and technology required to secure ground, air, and space based weapon platforms.
   - (U) Continue development on 25 and begin 8 additional individual technology plans for execution in: advanced computer penetration methods and countermeasures, security technology for distributed/ parallel computer systems, high speed encryption, secure database systems, and advanced technical security signal intercept and processing technology.

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

D. (U) WORK PERFORMED BY: All tasks under this program are managed through the Rome Laboratory, Griffis AFB, NY, and Electronic System Division (ESD), Hanscom AFB, MA. Contractors are: Lincoln Laboratory, Bedford, MA. (digital speech research); Arcon Corp., Bedford, MA. (math analysis and software development for in-house activities); and Massachusetts Institute of Technology, Boston, MA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: This Program Element has been identified as the sole Communication-Computer Security research and development effort for the Air Force, beginning in FY 1992. A number of tasks have been transitioned from other Program Elements to ensure no duplication of effort occurs and obtain the greatest benefit from common R&D. 18 new Statements of Need are being validated to satisfy multiple MAJCOM requirements.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: The incorporation of these other tasks, coupled with the greatly expanded computer security threat, requires the increased funding beginning in FY 1992.

Program Element: #0303401F Budget Activity: 5-Intelligence & Communications
PE Title: Communications Security (COMSEC) RDT&E

F. (U) PROGRAM DOCUMENTATION:

- (U) TAF SON 738-88C1, Multilevel Security for C3I Systems (U).
- (U) ESC SON 013-89C1, COMFY ASH (S).
- (U) SAC SON 000-89C1, Secure Database System (S).
- (U) SAC SON 000-89C1, Secure Management of Aggregation of Data (S).
- (U) SAC SON 000-89C1, Classified Material Control System (S).
- (U) AFMPC SON 000-089C1, Personnel Records Security System (S).
- (U) ESC SON 008-89C1, Advanced NONSTOP Test Set (S).
- (U) ESC SON 012-89C1, Computer Assisted Signal Analysis Technology Program (S).
- (U) ESC SON 009-89C1, Broadband Time Domain Signal Collection System (S).
- (U) ESC SON 011-89C1, Wideband Recorder/Player (S).
- (U) ESC SON 010-89C1, SHF/EHF Test System (S).
- (U) AFSPACECOM (pending), Handheld Secure Radios (U)
- (U) AFWL (pending), High Speed Key Generation Devices (U)

G. (U) RELATED ACTIVITIES:

- (U) The NSA is the overall manager of COMSEC development. There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Program Element #064740F, Computer Resource Management Technology (CRMT), is responsible for transitioning some of these R&D technologies to the field.

H. (U) OTHER APPROPRIATION FUNDS ($ IN THOUSANDS):

- (U) Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

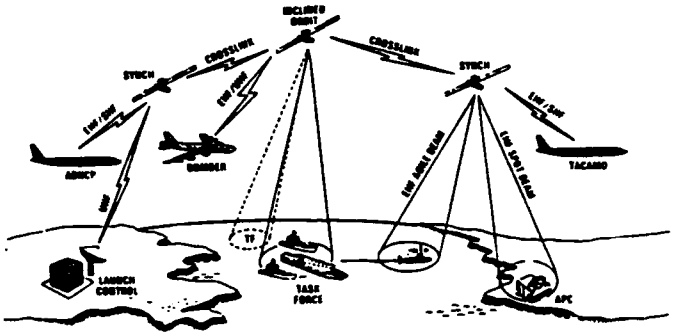
- (U) Not Applicable.

J. (U) MILESTONE SCHEDULE:

1.	(U) Field prototype electromagnetic remanence detection and elimination work stations.	2nd Qtr FY 1993
2.	(U) Field Multilevel Security prototype package.	3rd Qtr FY 1993
3.	(U) Field A-1 secure database for management prototype software packages.	2nd Qtr FY 1994

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303601F Project: #2487
PE Title: Milstar Satellite Communications System (Air Force Terminals) Budget Activity: #3 - Strategic Programs
Project Title: Milstar



POPULAR NAME: MILSTAR

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands):

BUDGET ($000)	FY 1990	FY 1991	FY1992	FY1993	To Complete
Major Contract	122.451	0.000	124.338	218.244	714.286
Support Contract	43.639	0.000	26.120	18.056	104.416
In-House Support	8.197	0.000	1.024	1.024	4.500
GFE/ Other	35.906	0.000	9.701	12.412	11.113
Total	210.193	0.000	161.183	249.736	834.315
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	N/A	LCT DEM/ VAL START	1st LRIP Delivery	LCT FSD START	LCT MS III, FSP, FY97
Engineering Milestones	System End-to-End Test with FEP	Complete FCA/PCA		N/A	System IOT&E 3QTR, FY92
T&E Milestones	Interoper-ability Demo	Operational Test Assessment	Operational Test Assessment	Terminal IOT&E	System IOT&E, 3rd Qtr, FY92
Contract Milestones	MS IIIA LRIP Award	LCT DEMO/VAL Award	LRIP & LCT Ongoing	Last Year LRIP, LCT FSD AWARD	MS III, FSP, Award FY97

Program Element: #0303601F Project: #2487
PE Title: Milstar Satellite Communication System (Air Force Terminals) Budget Activity: #3 - Strategic Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program develops and acquires Air Force Satellite Communication (AFSATCOM) Ultra High Frequency terminal modifications, AFSATCOM transponder test set upgrades, gap filler AFSATCOM payloads, and Air Force Extremely High Frequency (EHF) and EHF/Ultra High Frequency (UHF) airborne and ground terminals required to transition to the Milstar satellite system. Additionally, a Low Cost Terminal (LCT) will be developed for selected applications. The Milstar satellite system will provide a worldwide, survivable, jam-resistant, secure communications system to meet the minimum essential wartime communications needs of the President and Commanders-in-Chief to United States strategic and tactical forces up through the early stages of nuclear war.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Continued the EHF core terminal development and minor Engineering Change Orders (ECOs) under the core terminal development contract.
   - (U) Continued the fabrication and installation of Engineering Development Model (EDM) terminals for EC-135C aircraft and select ground sites.
   - (U) Continued field DT&E/OT&E and interoperability/inter-segment testing with the satellite payload simulator, the on-orbit FLTSAT EHF Package (FEP), mission control element, and Army and Navy terminals.
   - (U) Continued Low Rate Initial Production (LRIP).
   - (U) Incrementally funded the polar host AFSATCOM payload.

2. (U) FY 1991 Planned Program:
   - (U) Complete the EHF core terminal development.
   - (U) Continue ECOs under the core terminal development contract.
   - (U) Continue the fabrication and installation of Engineering Development Model (EDM) terminals for EC-135C aircraft and select ground sites.
   - (U) Continue field DT&E/OT&E and interoperability/inter-segment testing with the satellite payload simulator, the on-orbit FLTSAT EHF Package (FEP), mission control element, and Army and Navy terminals.
   - (U) Continue LRIP.
   - (U) Begin the Demonstration/Validation (DEM/VAL) phase of a Low Cost Terminal (LCT).
   - (U) Incrementally fund the polar host AFSATCOM payload.

3. (U) FY 1992 Planned Program:
   - (U) Initiate activities that were deferred as a result of FY90/91 budget cuts and continue ECOs under the "Core" terminal development contract.
   - (U) Complete fabrication and delivery of the EDM terminals .
   - (U) Continue installation of EDM terminals into EC-135C aircraft and select ground sites.
   - (U) Continue LCT DEM/VAL.
   - (U) Continue LRIP.
   - (U) Conduct System End-to-End testing with the first development satellite in factory.

Program Element: #0303601F Project: #2487
PE Title: Milstar Satellite Communication System (Air Force Terminals) Budget Activity: #3 - Strategic Programs

- ( )

- (U) Deliver first LRIP terminal.
- (U) Incrementally fund the polar host AFSATCOM payload.

4. (U) FY 1993 Planned Program:
   - (U) Begin full scale development of LCT.
   - (U) Complete installation of EDM terminals into EC-135C aircraft.
   - (U) Continue LRIP.
   - (U) Incrementally fund the polar host AFSATCOM payload.

5. (U) Program to Completion:
   - (U) complete system end-to-end testing.
   - (U) Begin full scale production of MEST.
   - (U) Maintain a and field 417 terminals and 12 mission control elements.

D. (U) WORK PERFORMED BY: Milstar terminals are being developed by Raytheon Company, Sudbury, MA and Rockwell International, Dallas, Tx. Federal Research Center support is provided by the MITRE Corporation, Bedford, MA, and Lincoln Laboratory, Bedford, MA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Substitutes the Low Volume Force Element Terminal with the Low Cost Terminal (MEST).
2. (U) SCHEDULE CHANGES: Consistent with a space segment slip the full scale development of SAC's strategic force element (B-2, B-1, LCC) terminal will slip until an FY93 start.
3. (U) COST CHANGES: Congress reduced funding in FY91 to force a program restructure. Procurement of fewer "Core" command post terminals and the development of a LCT resulted in a 48% FYDP savings and a 54% life cycle savings.

F. (U) PROGRAM DOCUMENTATION:

1. (U) Joint Milstar Communications, Control and Operations Concept (JMCCOC), Volume I (1 Jun 89) and Volume II (1 Aug 89)

G. (U) RELATED ACTIVITIES:

1. (U) PE 0303603F (Milstar Satellite Communications System (Space and Mission Control))
2. (U) PE 0303109N (Satellite Communication
3. (U) PE 0303605F (Satellite Communications Terminals)
4. (U) PE 0303603N (Milstar Satellite Communications System)
5. (U) PE 0101126F (B-1B)
6. (U) PE 0101213F (Minuteman Squadrons)
7. (U) PE 0101312F (Post Attack Command and Control System/Worldwide Command Post, EC-135H/J/P)
8. (U) PE 0302015F (National Emergency Airborne Command Post, E-4B)
9. (U) There is no unnecessary duplication of effort within AF or DoD.

Program Element: #0303601F Project: #2487
PE Title: Milstar Satellite Communication System (Air Force Terminals) Budget Activity: #3 - Strategic Programs

H. (U) OTHER APPROPRIATION FUNDS ($ In Thousands):

(U) Aircraft Procurement (BA 10)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost (PE 0302015F)	6,100	0,000	0,000	10,332	19,000	56,303
Spares	0,000	0,000	0,000	1,025	1,000	2,704
Quantity (Terminals)	1	0	0	1	1	4
Cost (PE 0101312F)	22,900	18,000*	34,109	35,131	0,000	195,840
Spares	4,942	0,000	1,989	1,069	0,000	16,700
Quantity (Terminals)	4	2	4	4	0	20
Cost (PE 0303601F)	0,000	0,000	0,000	0,000	602,000	602,000
Spares	11,765	0,000	0,000	0,000	125,000	136,765
Quantity (Terminals)	0	0	0	0	188	188

(U) Other Procurement (BA 16)

Cost	54,065	125,300*	263,907	170,389	343,000	1,064,000
Spares	29,789	67,000*	56,424	50,971	65,000	302,000
Quantity (Terminals)	6	17	32	23	105	190

(U) Military Construction (BA 14)

Cost	330	2,060	12,350	0,000	157,300	172,000

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

EVENT	DATE	RESULTS
- AFSATCOM Compatibility Test	Aug-Sep 88	Demonstrated backward compatibility with AFSATCOM
- Phase I Interoperability DEMO (Support LRIP Decision)	Oct-Nov 88	Demonstrated terminal/satellite waveform compatibility and terminal interoperability
- Phase II Interoperability DEMO	Aug 89	Demonstrated tri-service interoperability
- Terminal/MCE interface	May 90	Demonstrated terminal and MCE compatibility
- Phase III Interoperability DEMO (Support Navy IIIB Decision)	Oct 90	Verified tri-service Interoperability

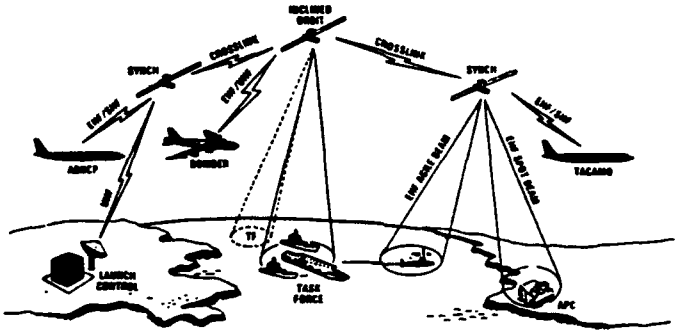
T&E ACTIVITY (TO COMPLETION)

EVENT	PLANNED DATE	REMARKS
- Phase IV Interoperability DEMO	FY92	
- IOT&E	FY93	
- Multi-Service IOT&E	FY94	

* NOTE: In the FY91 Defense Bills, Congress directed a restructure of the Milstar program, and placed the FY91 funds for the restructured program in PE 0603710D

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303603F Project: #2932
PE Title: Milstar Satellite Communications System (Space and Mission Control) Budget Activity: #3 - Strategic Programs
Project Title: Milstar



POPULAR NAME: Milstar

A. (U) SCHEDULE/BUDGET INFORMATION (S in Thousands):

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Major Contract	335,254	624,254	812,093	887,743	Continuing
Support Contract	31,289	31,367	32,935	34,591	Continuing
In-House Support	4,731	5,948	5,699	4,608	Continuing
GFE/ Other	28,726	48,431	50,536	35,832	Continuing
Total	400,000	710,000 *	901,263	962,774	Continuing
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	(To Complete)
Program Milestones			MDR MSII Apr 92		
Engineering Milestones	DFS-1 Fabrication Jun 90	DFS-1 Integration Nov 90		Complete DFS-2 Integration	Continue with follow on satellites
T&E Milestones	DFS-1 Electrical Test Jul 90	DFS-1 Integrated Test May 91			System Level IOT&E EOA FY 94
Contract Milestones		MDR System Architecture Development	Fab DFS-4, May 92, MDR FSD, May 92		Contract for DFS-5 and on, FY 94

* Appropriated at OSD level for FY91. Funds in PE 0603710D.

Program Element: #0303603F Project: #2932
PE Title: Milstar Satellite Communications System (Space and Mission Control) Budget Activity: #3 - Strategic Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The Milstar Satellite Communications System is a joint service program to develop and acquire the Milstar Extremely High Frequency (EHF) satellite, its mission control segment, and new or modified communications terminals. The Milstar system will provide a survivable, jam-resistant, world-wide, secure communications system to meet the minimum essential wartime communications needs of the President and Commanders-in-Chief to command and control US tactical and strategic forces up through the early stages of nuclear war. It will also support other high priority users in crisis/contingency situations. This Program Element (PE) funds for development of the Milstar satellite and its associated Mission Control Elements (MCE).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
- (U) Delivered Developmental Flight Satellite No. 1 (DFS-1) payload to prime contractor
- (U) Electrically integrated DFS-1 payload and bus
- (U) Completed interface and functional tests of DFS-1
- (U) Continued qualification tests for DFS-1
- (U) Continued planning for system level end-to-end testing using DFS-1, MCE and terminals of all Services
- (U) Continued launch vehicle integration
- (U) Continued fabrication of DFS-2 and 3
- (U) Completed planning and began activation of Milstar Operations Center (MOC) and Mission Control Center (MCC) at CSOC
- (U) Continued MCE development and logistics support planning
- (U) Continued planning for system Initial Operational Test and Evaluation (IOT&E) and Early Operational Assessment (EOA)

2. (U) FY 1991 Planned Program:
- (U) Begin Medium Data Rate (MDR) system architecture development
- (U) Continue DFS-1 first article qualification tests
- (U) Conduct Baseline Integrated Satellite Test (BIST)
- (U) Continue fabrication of DFS-2 and 3
- (U) Activate MOC and MCC at CSOC
- (U) Continue development of Mobile Constellation Control Station
- (U) Complete integration of engineering development model MCE into first IOT&E Constellation Control platform
- (U) Conduct detailed planning for Milstar system-level IOT&E EOA
- (U) Complete MCE qualification and terminal interface tests

3. (U) FY 1992 Planned Program:
- (U) Begin Full Scale Development of MDR system payload and start fabrication of DFS-4 Low Data Rate (LDR) payload and bus
- (U) Conduct inter-segment test using DFS-1, MCE, all Service terminals, and MCC
- (U) Conduct Final Integrated Satellite Test (FIST)
- ( )
- (U) Continue fabrication of DFS-2 and 3

Program Element: #0303603F Project: #2932
PE Title: Milstar Satellite Communications System (Space and Mission Control) Budget Activity: #3 - Strategic Programs

4. (U) FY 1993 Planned Program:
   - (U) Hold Preliminary Design Review for the MDR payload
   - (U)
   - (U) Continue fabrication, integration, and test of DFS-2 and 3
   - (U) Continue fabrication of DFS-4 with LDR payload
   - (U) Begin system level Early Operational Assessment

5. (U) Program to Completion:
   - (U) Hold Critical Design Review for MDR payload
   - (U) Complete development of MDR payload and integrate with DFS-4
   - (U) using Titan IVs and Centaur
   - ( )
   - ( )
   - ( )
   - (U) Complete installation of 13 development and production MCEs
   - (U) Conduct system-level EOA and IOT&E
   - (U) Milestone III satellite production decision in FY98
   - (U) Milstar is a continuing program

D. (U) WORK PERFORMED BY: The development of the Milstar satellite and the MCE for the Milstar system is managed by Air Force Systems Command's Space Systems Division, Los Angeles AFB, CA under the direction of the Air Force Program Executive Officer (PEO) for Space. The contract for Full Scale Development of the Milstar satellite, with LDR payload and MCEs was awarded in June, 1983. The prime contractor is Lockheed Missiles & Space Co., Sunnyvale, CA. The Aerospace Corporation, El Segundo, CA, provides general system engineering and integration.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Deletes prolonged nuclear warfighting endurance and survivability features, and adds a Medium Data Rate (MDR) payload for enhanced tactical use.

2. (U) SCHEDULE CHANGES: Slips DFS-2 and 3 by 3 months each due to Congressional funding reductions in FY91.
   to develop and incorporate the MDR payload.

3. (U) COST CHANGES: Congress reduced funding in FY91 to force program restructure. Development of MDR payload increases RDT&E funding and delay in satellite production reduces procurement funding.

F. (U) PROGRAM DOCUMENTATION:
   - (U) Joint Milstar Communications, Control and Operations Concept (JMCCOC), Volume I (Jun 1989) and Volume II (Aug 1989)
   - (U) Test and Evaluation Master Plan (TEMP), 18 Apr 1990
   - (U) System Operational Requirements Document (SORD), 27 Mar 1989

Program Element: #0303603F Project: #2932
PE Title: Milstar Satellite Communications System (Space and Mission Control) Budget Activity: #3 - Strategic Programs

G. (U) RELATED ACTIVITIES:
- (U) PE #0303601F Milstar (AF Terminals)
- (U) PE #0604577N (EHF Satellite Communications)
- (U) PE #0303142A (Tactical Communications Ground Environment)
- (U) PE #0303109N (Satellite Communications)
- (U) PE #0303605F (Satellite Communications Terminals)
- (U) PE #0305119F (Space Boosters)
- (U) PE #0303603N (Milstar Satellite Communications System)
- (U) There is no unnecessary duplication of effort with the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ In Thousands):

(U) Other Procurement (Electronics and Telecommunications Equipment) (BA 63)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Funds	0	0	0	46,555	0	46,555
I/S	0	0	0	26,609	0	26,609
Quantity	0	0	0	4	0	4*

* Milstar Mobile Constellation Control Stations

(U) Military Construction: Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

EVENT	DATE	RESULTS
(U) Parts Radiation Characterization (Satellite & MCE)	FY84-Present	Meeting specifications
(U) Circuit Hardening Development Testing (Sat. & MCE)	FY84-Present	Meeting specifications
(U) Payload to Terminal Interfact Testing	FY88/FY89	Requirements met; supported terminal production
(U) MCE/AF Terminal Interface Test	FY 90	Basic compatability shown
(U) Satellite Electrical Tests	FY 90	Met specifications
(U) Terminal Interoperability Tests/Demonstrations	FY88-Present	Requirements met; supported terminal production

T&E ACTIVITY (TO COMPLETION)

EVENT	PLANNED DATE	REMARKS
(U) Satellite Qualification Tests	FY90/FY92	
(U) Baseline Integrated Sat. Test	FY 91	
(U) Acoustic/Thermal Vacuum Tests	FY91/FY92	
(U) MCE Functional Qual. Test	FY91/FY92	
( )		
(U) System IOT&E Early Ops Assess	FY93/FY94	

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303605F Budget Activity: #4 - Tactical Programs
PE Title: Military Satellite Communications (MILSATCOM) Terminals

A. (U) RESOURCES ($ In Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3163 UHF Satellite Terminal System (USTS)	1,726	3,330	1,100	0		23,900
3164 Ground Mobile Forces Satellite Communications (GMFSC)	3,596	2,602	508	2,699	Continuing	TBD
XXX1 Single Channel Transponder System (SCTS)	0	0	600	1,507	Continuing	TBD
Total	5,322	5,932	2,208	4,206	Continuing	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program develops military satellite communications terminals and associated modulator/demodulator (modem) equipment for use by the Air Force, other Services, and US Allies. Developments currently underway address strategic and tactical deficiencies of US Military Satellite Communications (MILSATCOM) systems. There are three satellite terminal projects in this program element. The SCTS program was previously programmed and funded under Program Element (PE) 33601, MILSTAR. The funding associated with this pays for continuing support for the SCTS program.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 3163, UHF Satellite Terminal System (USTS): Develops the UHF Satellite Terminal System (USTS) for the Air Force Military Airlift Command (MAC). The USTS will be a small UHF satellite communications terminal which will operate in either the airborne or ground mobile mode in support of MAC and other Air Force requirements. Key Feature: USTS will permit more effective military operations by providing Air Force users with a flexible, reliable, and secure worldwide Command and Control (C2) system through a Demand Assigned Multiple Access (DAMA) scheme for 5 KHz UHF satellite channels. The USTS DAMA scheme will greatly increase the number of users able to access the satellite channel at any one time. It will be the DOD standard for 5 KHz UHF operations and will be implemented in future Army and Navy terminal programs. The USTS DAMA scheme will also provide interoperability for Air Force terminals with the Navy developed 25 KHz UHF satellite DAMA systems.

(U) FY 1990 Accomplishments:
- (U) Completed study of Type I COMSEC for USTS.
- (U) Completed portions of Developmental Test & Evaluation (DT&E).
- (U) Prepared 5 KHz DAMA Technical Interface Specification

(U) FY 1991 Planned Program:
- (U) Initiate development of the USTS terminal and network control system with NSA approved new Type I COMSEC and interoperable 5 KHz and 25 KHz DAMA schemes.
- (U) Complete DT&E
- (U) Prepare interface cable design change

Program Element: #0303605F Budget Activity: #4 - Tactical Programs
PE Title: Military Satellite Communications (MILSATCOM) Terminals

(U) FY 1992 Planned Program:
- (U) Complete development of the USTS terminal and network control system with Type I COMSEC and interoperable 5 KHz and 25 KHz DAMA schemes.
- (U) Initial Operational Test & Evaluation (IOT&E)
- (U) Achieve Production Decision

(U) FY 1993 Planned Program:
- (U) Conduct qualification testing for Type I COMSEC.
- (U) Obtain NSA certification for Type I COMSEC.
- (U) Begin production of USTS terminals and network control stations.

(U) Work Performed By: Work is being performed by the Electronic Systems Division (ESD)(Air Force Systems Command), Hanscom AFB MA. Contractor: TItan/Linkabit Division, San Diego, CA.

(U) Related Activities:
- (U) The Navy has developed the 25 KHz UHF DAMA scheme that the USTS program will incorporate for interoperability on 25 KHz UHF satellite channels.
- (U) An Army development program for a manpack UHF terminal (Advanced Manpack UHF Terminal - AMUT) will incorporate the USTS 5 KHz DAMA scheme into its design. This is required in response to JCS direction making the USTS DAMA scheme the DOD standard for 5 KHz UHF satellite channels.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds:

Other Procurement (BA 3):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	1,702	0	0	14,386	Cont	TBD

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3164, Ground Mobile Forces Satellite Communications (GMFSC): The US Air Force Ground Mobile Forces Program is completing fielding of Multi-Channel Super High Frequency (SHF) transportable satellite terminals for the Tactical Air Control System and Combat Communications forces. These terminals will be retrofitted with the Army developed Anti-Jam Control Modem (AJCM) providing full interoperability among all Services tactical SHF satellite communications terminals. The Air Force requires a small, lightweight SHF satellite communications terminal to provide reliable, secure voice and data for highly mobile combat teams such as Forward Air Controllers, Special Operations Forces, and Military Airlift Command (MAC) Combat Control Teams. This project will conduct a demonstration/validation effort for lightweight SHF satellite ground terminal technology to assess the feasibility of meeting user requirement with SHF manpack units. The development must achieve very compact lightweight units that can support flexible networks of many users with minimal impact on satellite resources.

Program Element: #0303605F Budget Activity: #4 - Tactical Programs
PE Title: Military Satellite Communications (MILSATCOM) Terminals

(U) FY 1990 Accomplishments:
- (U) Completed integration engineering for installing the AJCM modems into the multi-channel SHF terminals worldwide.
- (U) Initiated acquisition specification for SHF lightweight manpack terminals.
- (U) Developed Multi-Command Required Operational Capability (MROC) and associated Technical Analysis/Cost Estimate (TA/CE) for Super High Frequency Demand Assigned Multiple Access (DAMA) networks, as tasked by the Joint Staff.

(U) FY 1991 Planned Program:
- (U) Initiate the demonstration/validation program for SHF lightweight manpack terminals.

(U) FY 1992 Planned Program:
- (U) Complete the Demonstration/Validation program for SHF lightweight manpack terminals.
- (U) Initiate study of UHF DAMA controller.

(U) FY 1993 Planned Program:
- (U) Initiate Full Scale Development of the lightweight manpack terminals.
- (U) Develop UHF DAMA controller

(U) Work Performed By: The SHF multi-channel terminals currently being fielded, were developed and manufactured by RCA, Camden NJ. Electronic Systems Division (Air Force Systems Command), Hanscom AFB, MA manages the program for the Air Force. The US Army Satellite Communications Agency was the contracting office for this project.

(U) Related Activities:
- (U) The GMF Satellite Communications (GMFSC) program is a joint service program addressing tactical forces satellite communications requirements of the Army, Air Force and Marine Corps.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds:

Other Procurement (BA 3):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	13,599	2,694	2,000	2,242	Cont	TBD

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project XXXI, Single Channel Transponder System (SCTS): Research and engineering for the space segment of the SCTS program is accomplished at Space Division/AFSC. The type of work performed is required to be done on a continuing/yearly basis in order to keep the space segment healthy and the transponders technically in tact on the aging DSCS, Polar, AFSATCOM (package on FLTSATCOM) satellites until the MILSTAR program is fully operational. The SCTS program is a part of the overall transition from AFSATCOM to Milstar, providing required jamming and nuclear effects protection for critical

Program Element: #0303605F Budget Activity: #4 - Tactical Programs
PE Title: Military Satellite Communications (MILSATCOM) Terminals

National Command Authorities (NCA) communications. More specifically, SCTS provides an Emergency Action Message (EAM) and Force Direction Message (FDM) dissemination capability to selected command centers and force elements. Without this research and engineering effort, the SCTS satellite transponders would soon become inoperative for survivable force projection/force execution.

(U) FY 1990 Accomplishments: Not Applicable.

(U) FY 1991 Planned Program: Not Applicable.

(U) FY 1992 Planned Program:

- (U) Conduct GAP analysis of UHF and SHF resources on AFSATCOM SCTS, UHF Follow-on and Milstar Host.
- (U) Conduct studies and analysis of the Polar Host satellite system.

(U) FY 1993 Planned Program:

- (U) Conduct GAP analysis of UHF and SHF resources on AFSATCOM SCTS, UHF Follow-on and Milstar Host.
- (U) Maintain on-orbit integrity of SCTS on Polar Host satellites.
- (U) Perform system timing upgrades to SCTS. (Reason for increase over FY92)
- (U) Provide NEACP and SCTS flight tests support. (Reason for increase over FY92)

(U) Work Performed By: Work is being performed by Space Division (SD)/AFSC, Los Angeles, CA. Contractors: Aerospace Corporation and General Electric of Los Angeles, CA.

(U) Related Activities: None. There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds:

Other Procurement (BA 3):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	500	2,700	0	0	Cont	TBD

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305110F Budget Activity: #6-Defense Wide Mission Support
PE Title: Satellite Control Facility (SCF)

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
XXX1 Air Force Satellite Control Network (AFSCN)	85,329	117,148	117,433	108,630	Cont	TBD
4045 Integrated Satellite Control System (ISCS)	0	0	3,222	8,012	Cont	TBD
Total	85,329	117,148	120,655	116,642	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The SCF has evolved into the Air Force Satellite Control Network (AFSCN), a global network of communications and computer systems to control the growing inventory of increasingly complex national security space vehicles. The AFSCN project funds the development and acquisitions needed to evolve to this highly reliable national satellite tracking, telemetry and commanding capability to meet the requirements of the satellite systems it supports. The Integrated Satellite Control System (ISCS) provides the framework for an evolution of DoD satellite control systems toward an integrated, interoperable, distributed, and cost-effective capability necessary to simplify operations, reduce life cycle costs, and perform operations even in non-nominal operational scenarios. In FY 1992/1993 ISCS funds the study and technology efforts which are needed to provide the umbrella architecture that will guide how DoD will conduct and support space operations (including ground, communications, space, and support segments) well into the next century.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305110F
PE Title: Satellite Control Facility (SCF)
Project Number: XXX1
Budget Activity: #6-Defense Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
AFSCN	85,329	117,148	117,433	108,630	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The AFSCN project funds the development, acquisition, and continuing support to a highly reliable national satellite tracking, telemetry and commanding capability in support of developmental and operational satellite systems. The AFSCN is a global network of communications and computer systems required to support a growing inventory of increasingly complex space vehicles which support operational forces in peace and wartime. The AFSCN must continue to be responsive to the requirements of the satellite systems it supports.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1990 Accomplishments:
- (U) Provided system engineering and development of network hardware and software modifications to meet evolving satellite needs.
- (U) Continued transition of satellite programs from the old data system configuration to a new computer configuration.
- (U) Initiated upgrade of third increment of three stations under Automated Remote Tracking Stations (ARTS) Acquisition II.

(U) FY 1991 Planned Program:
- (U) Provide system engineering and development of network hardware/ software modifications to meet evolving program requirements.
- (U) Increase upgrade efforts supporting transition of satellite programs from the old data systems configuration to a new computer configuration.
- (U) Initiate upgrade of fourth increment of four stations under ARTS Acquisition II.
- (U) Provide ARTS Diego Garcia tracking station IOC.
- (U) Complete upgrade of three stations under ARTS Acquisition II.

(U) FY 1992 Planned Program:
- (U) Provide system engineering and development of network hardware/ software modifications to meet evolving satellite program requirements.
- (U) Continue transition of satellite programs from the old data systems configuration to a new computer configuration.
- (U) Complete upgrade of four stations under ARTS Acquisition II.
- (U) Retrofit three ARTS stations to Acquisition II configuration.

Program Element: #0305110F | Project Number: XXX1
PE Title: Satellite Control Facility (SCF) | Budget Activity: #6-Defense Wide Mission Support

(U) FY 1993 Planned Program:
- (U) Provide system engineering and development of network hardware/ software modifications to meet evolving satellite program requirements at the Consolidated Space Test Center (CSTC).
- (U) Initiate engineering/modification support to the Consolidated Space Operations Center (CSOC).
- (U) Complete transition of satellite programs from the old data systems configuration to a new computer configuration.
- (U) Complete upgrade of three stations and two satellite pre-launch checkout facilities under ARTS Acquisition II.

(U) Program To Completion:
- (U) This is a continuing program.

D. (U) WORK PERFORMED BY: In-house efforts will be accomplished by Air Force Systems Command Space Systems Division, Los Angeles, CA. Principal contractors are: Loral Space & Range Systems, Sunnyvale, CA, provides development and analysis for ARTS, range systems and communications; Aerospace Corporation, El Segundo, CA, provides general system engineering and integration support; Space Applications Corporation, San Jose, CA, provides system engineering integration and test analysis (Small Business Set-Aside); IBM, Sunnyvale CA & Gathersburg, MD, provides command and control data systems sustaining engineering.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: In FY 1993, remaining Consolidated Space Operations Center initial operational testing and completion of logistics activities for the Communications Segment (CS) will be performed within this program (transferred from CSOC PE 0305130F). FY 1992 $5.9M funding (for CSOC CS that was to transfer from CSOC program to this program) was moved to FY 1993 and remained in CSOC PE 0305130F. All other PE 0305130F RDT&E funds (for FY 1993 and beyond) are in this PE 0305110F
2. (U) SCHEDULE CHANGES: Not Applicable.
3. (U) COST CHANGES: Not Applicable.

F. (U) PROGRAM DOCUMENTATION:
- (U) Multicommand Required Operational Capability (MROC) for an Integrated Satellite Control System (ISCS), Dec 89.
- (U) ARTS Test and Evaluation Master Plan (TEMP), Annual Update.
- (U) AFSCN Master Development Plan (MDP), Annual Update.

G. (U) RELATED ACTIVITIES:
- (U) Program Element 0305151F, SCF Telecommunications.
- (U) Program Element 0305894F, Real Property Maintenance, AFSC.
- (U) Program Element 0305896F, Base Operating Support, AFSC.
- (U) Program Element 0305173F, Consolidated Space Test Center.
- (U) Program Element 0305130F, Consolidated Space Operations Center
- (U) There is no unnecessary duplication of USAF or DoD effort.

Program Element: #0305110F
PE Title: Satellite Control Facility (SCF)
Project Number: XXX1
Budget Activity: #6-Defense Wide Mission Support

H. (U) OTHER APPROPRIATION FUNDS:

(U) Other Procurement (BA 83):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	Total Program
Cost	67,315	82,744	28,836	40,884	TBD

(U) Military Construction:

Funds	20,200	4,600	0	0	TBD

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE:

1.	(U) Automated Remote Tracking Station (ARTS) Contract Award	Jun 1984
2.	(U) Command and Control Sustaining Engineering Contract Award	Jan 1986
3.	(U) ARTS-Thule Tracking Station Initial Operational Capability	Mar 1988
4.	(U) ARTS Acquisition II Contract Award	Aug 1988
5.	(U) ARTS-Diego Garcia Station IOC	2Q FY 1991
6.	(U) ARTS Modification of Existing Stations	1990 - 1993
7.	(U) Complete Transition of Satellite Programs to New C^2 System	3Q FY 1993
8.	(U) ARTS Full Operational Capability (FOC)	4Q FY 1993
9.	(U) CSOC Full Operational Capability (FOC)	4Q FY 1993

FY 1992/1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305110F
PE Title: Satellite Control Facility (SCF)
Project Number: 4045
Budget Activity: #6-Defense Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Integrated Satellite Control System (ISCS)	0	0	3,222	8,012	TBD	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Provide system engineering, technology transition, and standardization efforts necessary to implement the requirements of the JCS approved Multicommand Required Operational Capability (MROC) 04-88 for an Integrated Satellite Control System (ISCS). The Air Force has been designated lead service for multi-service ISCS implementation. ISCS provides the architectural framework for an incremental evolution of DoD satellite control systems toward an integrated, interoperable, distributed, and cost-effective capability necessary to simplify operations, reduce life cycle costs, and perform operations even in non-nominal operational scenarios. Systems engineering, standards development, architectural integration, and technology transitions will be executed within this program element.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1990 Accomplishments:
- (U) AFSPACECOM and AFSC began planning the integration and standardization of applicable satellite control programs.

(U) FY 1991 Planned Program:
- (U) ISCS efforts started under PE 0605808F, Developmental Planning, used to structure the program and provide integration and standardization planning necessary for the third quarter EPR.
- (U) Integrate satellite control requirements for existing and planned space systems.

(U) FY 1992 Planned Program:
- (U) Define and coordinate a detailed ISCS distributed architecture; includes cost/utility/benefit optimization among distributed elements: fixed and mobile ground control, space based assets, communications segment, and support environment.
- (U) Develop standards for space support systems.
- (U) Sponsor ISCS specific technology transition programs.
- (U) Leverage ISCS related technology development programs already being pursued outside this PE.

Program Element: #0305110F
PE Title: Satellite Control Facility (SCF)
Project Number: 4045
Budget Activity: #6-Defense Wide Mission Support

- (U) Develop simulation and analysis tools sufficient to model ISCS loading requirements, communication throughput, and resource utilization over a 15 year planning horizon.

(U) FY 1993 Planned Program:
- (U) Refine detailed ISCS distributed architecture.
- (U) Validate and enforce standards for space support systems.
- (U) Develop ISCS technology transition plans and architectural elements on a program by program basis, to include integration development, schedule, and cost impact estimates.
- (U) Continue development of ISCS simulation and analysis tools.
- (U) Sponsor ISCS specific technology transition programs.
- (U) Influence or leverage ISCS related technology development programs already being pursued outside this PE.

(U) Program To Completion:
- (U) Continue systems engineering and architectural integration.
- (U) Validate and enforce standards for space support systems.
- (U) Sponsor ISCS specific technology transition programs.
- (U) Influence or leverage ISCS related technology development programs being pursued outside this PE.
- (U) Integrate ISCS related implementation efforts being performed within other PEs.
- (U) Implement USAF portion of ISCS common user requirements.

D. (U) WORK PERFORMED BY: In-house efforts accomplished by the Air Force Systems Command Space Systems Division, Los Angeles, CA. Aerospace Corporation, El Segundo, CA, provides general system engineering and integration support; other study, engineering, and development analysis will be provided by SSD planning and engineering support contractors, who will be determined pending competition of contracts.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY: Not Applicable.

F. (U) PROGRAM DOCUMENTATION:
- (U) Multicommand Required Operational Capability (MROC) for an Integrated Satellite Control System (ISCS), Dec 89.

G. (U) RELATED ACTIVITIES:
- (U) PE 0603438F, Space System Survivability
- (U) PE 0605808F, Developmental Planning
- (U) PE 0603401F, Advanced Spacecraft Technologies
- (U) PE 0604711F, System Survivability
- (U) PE 0305173F/0604940D, Consolidated Space Test Center.
- (U) PE 0305130F, Consolidated Space Operations Center.
- (U) PE 0303110F, Defense Satellite Communications System.
- (U) PE 0303601F, Air Force Satellite Communication Program.
- (U) PE 0303603F, Milstar Satellite Communications Program.
- (U) PE 0102431F, Defense Support Program (DSP).

Program Element: #0305110F
PE Title: Satellite Control Facility (SCF)
Project Number: 4045
Budget Activity: #6-Defense Wide Mission Support

- (U) PE 0305164F/0305165F, NAVSTAR Global Positioning System.
- (U) PE 0305160F/0305162F, Defense Meteorological Satellite Program
- (U) PE 0603218C, Strategic Defense System Research & Support.
- (U) PE 0303109N, FLTSATCOM and UHF Follow on Programs.
- (U) Army's DSCS Operating Centers Ground Network.
- (U) PACER Frontier Logistics Support Program.
- (U) There is no unnecessary duplication of effort within the Air Force or DoD.

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE:
- ISCS architectural definition; Executive Program Review, 3Q FY 1991.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305114F
PE Title: Air Traffic Control And Landing Systems (ATCALS)

Budget Activity: #5-Intelligence and Communications

A. (U) RESOURCES ($ In Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2026 System Support	4,338	556	476	714	Cont	TBD
2759 Mobile Microwave Landing System (MMLS)	7,200	0	0	0	0	37,731
3042 BAMBOO TREE	317	0	0	0	0	2,017
3587 Microwave Landing Systems (MLS) Avionics	12,953	15,207	10,883	13,201	Cont	TBD
TOTAL	24,808	15,763	11,359	13,915	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program provides the Air Force with the Air Traffic Control and Landing Systems (ATCALS) (formerly called Traffic Control and Landing Systems (TRACALS)) equipment required for safe, efficient, worldwide, and all weather flying operations. The mission is to provide takeoff, enroute, and landing guidance (surveillance) in order to meet wartime sortie requirements. In peacetime, the mission is to support training, logistics, and other operational flying with maximum safety. Equipment in the above projects satisfy tactical/mobile needs of the Air Force. Microwave Landing Systems (MLS) avionics will be interoperable with both fixed-base and mobile MLS equipment.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2026, System Support: Continues RDT&E support for ATCALS programs including several joint efforts with the Federal Aviation Administration (FAA).

(U) FY 1990 Accomplishments:

- (U) Continued definition of the USAF - FAA interface for the National Airspace System. See PE #0305137, National Airspace System (NAS) Descriptive Summary.
- (U) Cost/tradeoff studies and analyses to support NAS.
- (U) Continued definition studies to use the Global Positioning System (GPS) as an interface with the air traffic control system for both USAF and the FAA.
- (U) Specification development for the Military Airspace Management System (MAMS) prototyping effort.

Program Element: #0305114F Budget Activity: #5-Intelligence/Communications
PE Title: Air Traffic Control And Landing Systems (ATCALS)

(U) FY 1991 Planned Program:
- (U) Continue support for all ATCALS projects.
- (U) Close out of the Digital Bright Radar Indicator Tower Equipment Displays and Flight Data Input/Output projects.

(U) FY 1992 Planned Program:
- (U) Continue support for all ATCALS projects.

(U) FY 1993 Planned Programs:
- (U) Continue support for all ATCALS projects.

(U) Work Performed By: Air Force Systems Command Electronic Systems Division, Hanscom AFB, MA manages the overall ATCALS effort. Mitre Corporation, Bedford, MA, provides system support.

(U) Related Activities:
- (U) Program Element #0305137F, National Airspace System.
- (U) Program Element #0305164F, Navstar Global Positioning System.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2759, Mobile Microwave Landing System (MMLS): Develops a compact rapidly deployable MMLS for use at austere airfields providing precision landing capabilities.

(U) FY 1990 Accomplishments:
- (U) Completed Critical Design Reviews (CDR).
- (U) Start fabrication of six developmental test units.
- (U) Started Developmental Test and Evaluation (DT&E).

(U) FY 1991 Planned Program:
- (U) Complete DT&E and begin Initial Operational Test and Evaluation (IOT&E).
- (U) Complete fabrication of six developmental test units and begin reliability verification testing.
- (U) Production decision.

(U) Work Performed By: Bell Aerospace, Buffalo, NY. Air Force Systems Command Electronic Systems Division, Hanscom AFB, MA, manages the MMLS effort. ARINC Research Corporation, Annapolis, MD and Mitre Corporation, Bedford, MA provide technical/cost support.

Program Element: #0305114F Budget Activity: #5-Intelligence/Communications
PE Title: Air Traffic Control And Landing Systems (ATCALS)

(U) Related Activities: None.
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):
- (U) Production of 38 MMLSs in FY 92.

(U) Procurement (3080):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	0	11,196	14,083	0	0	26,279

(U) International Cooperative Agreements: None.

3. (U) Project 3042, BAMBOO TREE: BAMBOO TREE provides continued RDT&E support to ensure the United States has air access to the Berlin corridors.

(U) FY 1990 Accomplishments:
- (U) Integration of the Templehof radio system.
- (U) Based on the unification of Germany, the BAMBOO TREE project was cancelled.

(U) Work Performed By: Air Force Systems Command, Electronic Systems Division managed the BAMBOO TREE effort. Air Force Communication Command installed the upgrade.

(U) Related Activities: None.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):
- (U) Acquisition and installation of radios and amplifiers.

(U) Procurement (3080):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	649	0	0	0	0	2,060

(U) Military Construction: Not Applicable.

(U) International Cooperative Agreements: None

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305114F
PE Title: Air Traffic Control And Landing Systems (ATCALS)
Project Number: # 3587
Budget Activity: # 5 - Intelligence and Communications

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Microwave Landing System Avionics (MLSA)	12,953	15,207	10,881	13,324	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES: This effort develops the Military Microwave Landing System Avionics (MMLSA). This acquisition is part of a twenty year program to transition the Air Force operations from use of Precision Approach Radars (PAR) and Instrument Landing Systems (ILS) to the international Microwave Landing System (MLS) for precision landing operations. The MMLSA will be developed for integration and installation on high performance and space constrained aircraft. MMLSA will have both MLS and ILS capabilities. The MMLSA will work in the airborne uninhabited fighter environment, capable of high-G stress, and have a significantly increased Mean Time Between Failure (MTBF) in comparison to current systems (7,000 hour fielded MTBF planned).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Contract Awarded Dec 89.
   - (U) MMLSA development started.
   - (U) Started F-16 integration studies.
   - (U) Initiated DT&E test definition.

2. (U) FY 1991 Planned Program:
   - (U) Continue development of MMLSA
   - (U) Complete F-16 integration studies.
   - (U) Begin software integration definition for F-16.
   - (U) Complete DT&E test definition.

3. (U) FY 1992 Planned Program:
   - (U) Complete MMLSA development and fabrication of FSD test units.
   - (U) Start F-16 integration.
   - (U) MMLSA Early Operational Assessment.
   - (U) F-16 System Integration Laboratory Testing.
   - (U) Start F-16 "A" Kit development.

4. (U) FY 1993 Planned Program:
   - (U) Award MMLSA first article test contract.
   - (U) Development and fabrication of test units to support

Program Element: #0305114F Project Number: # 3587
PE Title: Air Traffic Control And Landing Systems (ATCALS) Budget Activity: # 5 - Intelligence and Communications

first article testing.
- (U) Continue F-16 integration and kit development.

5. (U) Program to Completion:
   - (U) Start DT&E Nov 93 and IOT&E Feb 94.
   - (U) Production decision Aug 94.
   - (U) Initial Operational Capability in FY 1996.
   - (U) Acquisition of 7542 systems through FY 2005.

D. (U) WORK PERFORMED BY: The MMLSA FSD contract was awarded to Rockwell International, Cedar Rapids, Iowa; GEC/Marconi Corp, Wayne, NJ; and Hazeltine Corp, Greenlawn, NY. Three contractors were selected for FSD. Through full and open competition, two contractors will be selected for production.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: KC-135 integration cancelled.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: Funds cuts eliminated KC-135 integration efforts.

F. (U) PROGRAM DOCUMENTATION:
- (U) Air Force Communications Command General Operating Requirement, Advanced Military Landing System, 16 Feb 78.
- (U) Justification of Major System New Start, 5 May 82.
- (U) R-S 2026(5)/35114F, PMD for TRACALS (404L), 23 Oct 81, as amended.
- (U) HQ USAF/RDS Ltr, Service Responsibilities for MLS, 4 Apr 83.
- (U) DOD MLS Implementation Plan, 1 Jun 84.
- (U) Joint Requirements Oversight Council Memo, MLS, Action Memo, 27 Mar 87.
- (U) NATO Air Force Armaments Group V on Avionics and Landing Systems Standardization Agreement on MLS (STANAG 4184).
- (U) 4030(10)/35114F, PMD for MLS, 28 Feb 90.
- (U) MLS Acquisition Decision Memorandum, 27 Jul 89.

G. (U) RELATED ACTIVITIES:
- (U) Part of the overall effort for the USAF acquisition of the Fixed Base MLS, Commercial MLS Avionics, and Mobile MLS.
- (U) USAF lead agency for tri-service program working concurrently with the FAA.
- (U) Global Positioning System (GPS) to be investigated as an alternative to precision distance measuring equipment (Program Element #0305164F).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

Program Element: #0305114F Project Number: # 3587
PE Title: Air Traffic Control And Landing Systems (ATCALS) Budget Activity: # 5 - Intelligence and Communications

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands):
- (U) FY 90-92 funds integration and installation of the Commercial Microwave Landing System Avionics (CMLSA) for 539 C-130s.
- (U) FY 93 funds continue CMLSA installations and starts the first article testing and integration of the MMLSA on the F-16.

(U) Procurement (3010):

Cost	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
	6,208	10,434	7,964	7,949	388,590	421,500

(U) MILITARY CONSTRUCTION: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE (MMLSA):

1.	Milestone II	June 1989
2.	Contract Award	December 1989
3.	Early Operational Assessment	April 1992
4.	DT&E	November 1993
5.	Operational Test and Evaluation	February 1994
6.	Milestone III	August 1994
7.	Production Contract	September 1994

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305119F
PE Title: Medium Launch Vehicles (formerly Space Boosters)
Project: # N/A
Budget Activity: #6 - Defense-Wide Mission Support

A. (U) RESOURCES ($ In Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Medium Launch Vehicles	404,554*	184,774*	45,615	43,754	Cont	TBD

* Includes Titan IV funding. A separate PE has been established for Titan IV, PE 35144F, beginning in FY 92. MLV unique costs were $54,021 in FY 90 and $56,521 in FY 91.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
National security requirements dictate a continuing, highly reliable means of placing critical Department of Defense (DOD) satellites into required orbits. Assured access to space, directed by the President in the National Security Launch Strategy, will be accomplished through the use of a robust mix of Expendable Launch Vehicles (ELVs). The Medium Launch Vehicles program provides development, procurement and launch of DOD ELVs. These include Delta II and Atlas II at Cape Canaveral AFS, Florida as well as Titan II, Atlas E, AF Small Launch Vehicle (AFSLV) and Pegasus at Vandenberg AFB, California. Major development efforts include the following: Delta II upgrades, composite solid rocket motor cases, liquid rocket engine changes and new payload fairings. Development and modification of 14 Titan II SLVs, procurement of two Pegasus launches and up to 15 small launch vehicles, development and procurement of up to 44 Delta II's and planning for up to 10 Atlas II launches are ongoing. This program also provides engineering support for the AFSLV, and management support for Medium Launch Vehicles. ELV performance is as follows:

BOOSTER	MISSION ORBIT	CAPABILITY (lb to orbit)
Atlas II	Geosynchonous transfer	6,100
Delta II	Semi-synchronous	2,500
Titan II	Low Polar	4,200
Atlas E	Low Polar	1,750
Pegasus/AFSLV	Low Polar	430

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Six successful Delta II launches of Global Positioning System (GPS) satellites and NASA's Roentgen satellite
   - (U) Started acquisition of AF Small Launch Vehicle (AFSLV)
   - (U) Developed Precision Injection Kit for AF Pegasus Flight #1
   - (U) Continued refurbishment of Titan II boosters

Program Element: #0305119F
PE Title: Medium Launch Vehicles
Project: # N/A
Budget Activity: #6 - Defense-Wide Mission Support

2. (U) FY 1991 Planned Program:
   - (U) Launch Pegasus with AF payload
   - (U) Launch three Atlas E boosters to support the Defense Meteorological Satellite program (DMSP) and the National Oceanic Atmospheric Administration (NOAA) (two for DMSP-one for NOAA)
   - (U) Complete activation of Atlas II launch complex (SLC-36) at Cape Canaveral AFS
   - (U) Launch first Atlas II launch vehicle (two planned in FY 91)
   - (U) Launch five Delta IIs for GPS (including new 7925 configuration)
   - (U) Award AFSLV contract to support the AF Space Test Program

3. (U) FY 1992 Planned Program:
   - (U) Titan II, Delta II, and Atlas II flight assessment, vendor qualification, and component/subsystem replacement
   - (U) Continue Titan II refurbishment and Delta II procurement
   - (U) Launch three Titan II, six Delta II, and two Atlas II boosters
   - (U) Launch second Air Force-sponsored Pegasus
   - (U) Integrate Space Test Program satellite on Medium Launch Vehicle
   - (U) Procure two AFSLVs in support of Space Test Program

4. (U) FY 1993 Planned Program:
   - (U) Launch two Atlas II, four Delta II, three Titan II boosters
   - (U) Launch first AFSLV in support of Space Test Program

5. (U) Program to Completion
   - (U) This is a continuing program
   - (U) Continue Titan II, Delta II, Atlas II, and AFSLV launches to support critical national and space test payloads
   - (U) Complete development on Delta II, Atlas II, and AFSLV

D. (U) Work Performed By: The responsible Air Force agency is Air Force Systems Command's Space Systems Division, Los Angeles AFB, CA. Systems engineering is provided by the Aerospace Corporation, El Segundo, CA. Delta II prime contractor include is McDonnell Douglas Space Systems Corporation, Huntington Beach, CA. Atlas II prime contractor is General Dynamics, Space Systems Division, San Diego, CA. Titan II prime contractor is Martin Marietta Corporation, Denver, CO. Pegasus contractor is Orbital Sciences Corporation, Fairfax, VA. AF Small Launch Vehicle contractor is to be determined by full and open competition with contract award planned for March 1991.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: none
2. (U) SCHEDULE CHANGES: none
3. (U) COST CHANGES: none

Program Element: #0305119F
PE Title: Medium Launch Vehicles
Project: # N/A
Budget Activity: #6 - Defense-Wide Mission Support

F. (U) PROGRAM DOCUMENTATION:
- (U) National Space Policy, January 1988
- (U) Program Decision Memorandum, 25 July 1988

G. (U) RELATED ACTIVITIES:
- (U) Progam Element #0305144F, Titan IV Space Booster
- (U) Classified space programs*
- (U) Program Element #0303110F, Defense Satellite Communications System
- (U) Program Element #0305165F, Global Positioning System
- (U) Program Element #030516F, Defense Meteorological Satellite Program
- (U) Program Element #0603402, Space Test Program
- (U) The National Oceanic and Atmospheric Administration polar orbiting meteorological and earth resources satellites*
- (U) There is no unnecessary duplication of this effort within the Air Force or the Department of Defense.

* Activities which reimburse the Medium Launch Vehicles program for expendable launch vehicle services.

H. (U) OTHER APPROPRIATION FUNDS ($ in thousands):
(U) Missile Procurement (BA 5):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	167,086*	274,399*	224,983*	241,055*	Cont	TBD
Units	3	5	4	4	Cont	TBD

* Includes Titan II but not Titan IV funding.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) MILESTONE SCHEDULE:

1.	(U) Titan II Acquisition started	January 1986
2.	(U) Delta II acquisition started	January 1987
3.	(U) Atlas II acquisition started	January 1988
4.	(U) Titan II first launch	September 1988
5.	(U) Delta II first launch	February 1989
6.	(U) Pegasus first launch	April 1990
7.	(U) AF Small Launch Vehicle (AFSLV) award	March 1991
8.	(U) Atlas II first AF launch	May 1991
9.	(U) AFSLV first launch	FY 1993

FY 1992/1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305130F
PE Title: Consolidated Space Operations Center (CSOC)
Project Number: XXX1
Budget Activity: #6-Defense Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
CSOC	26,938	21,790	15,657	5,906	0	466,809

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Consolidated Space Operations Center (CSOC) program funds development and acquisition of a major facility for the planning and execution of Department of Defense (DOD) space operations. CSOC, located at Falcon Air Force Base, CO, is a major operational center within the Air Force Satellite Control Network (AFSCN), a worldwide configuration of ground resources consisting of Remote Tracking Stations (RTS), communications and control centers. CSOC's main element is the Satellite Operations Complex (SOC). Supporting elements include the Communications Segment (CS) and Network Control Segment (NCS). SOC will control operational DOD satellites through its three Mission Control Centers (MCCs). The CS provides intrastation communications and connectivity to the existing AFSCN. The NCS schedules and controls the RTS. CSOC will correct vulnerability, electronic privacy and capacity deficiencies in the existing satellite control architecture and implement JCS mandated Integrated Satellite Control System (ISCS) concepts.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1990 Accomplishments:
- (U) MCC-1A (GPS) initial operations by AFSPACECOM (pre-turnover).
- (U) MCC-1B (DMSP) initial operations by AFSPACECOM (pre-turnover).
- (U) Initial operational Weather Support Unit (pre-turnover).
- (U) Performing initial Communications Segment (CS) training.
- (U) Completion of on-going system tests will demonstrate tracking, monitoring, and commanding of DSP and DMSP in MCC-1 and military communications satellites (COMSATs) in MCC-2.

(U) FY 1991 Planned Program:
- (U) Operational turnover of Weather Support Unit to AFSPACECOM
- (U) Complete initial operational testing of MCC-1A (GPS) and MCC-2 (COMSAT).
- (U) Completion of initial operational testing for turnover of Security Control System operations to AFSPACECOM.
- (U) Turnover operations in MCC-2 (COMSATs) to AFSPACECOM.
- (U) Continue development and integration of the CS.

Program Element: #0305130F Project Number: XXX1
Title: Consolidated Space Operations Center Budget Activity: #6-Defense Wide Mission Support

(U) FY 1992 Planned Program:
- (U) NCS range scheduling/control will become fully operational.
- (U) Complete initial DSP operational testing in MCC-1B.
- (U) Complete initial DMSP operational testing in MCC-1B.
- (U) Complete initial operational testing NCS.
- (U) Turnover DSP operations in MCC-1B to AFSPACECOM.
- (U) Turnover DMSP operations in MCC-1B to AFSPACECOM.
- (U) Turnover GPS operations in MCC-1A to AFSPACECOM.
- (U) Turnover COMSATs operations in MCC-2 to AFSPACECOM.
- (U) Turnover NCS operations to AFSPACECOM.
- (U) Perform developmental testing of Communications Segment.

(U) FY 1993 Planned Program:
- (U) Complete Communications Segment (CS) baseline capabilities.
- (U) Complete initial operational testing of the CS.
- (U) Complete initial operational testing of entire CSOC system.
- (U) FOC and turnover of CS operations to AFSPACECOM.

(U) Program To Completion: Not Applicable (RDT&E complete in FY 1993).

D. (U) WORK PERFORMED BY: In-house efforts will be accomplished by the Air Force Systems Command Space Systems Division, Los Angeles, CA. Major contractors are TRW, Redondo Beach, CA; Space Communications Co., a CONTEL division, Gaithersburg, MD; ISYS Security Systems, a JWP division, Los Alamitos, CA; The Aerospace Corp, El Segundo, CA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) Technical Changes: User requires Launch and Early Orbit support capability in MCC-2 prior to operational turnover. Launch and Early Orbit support capability required for the Integrated Apogee Boost System (IABS), a new configuration.

2. (U) Schedule Changes: Mission Control Center (MCC) 2 Operational milestone slipped six months due to evolving user requirements, such as IABS. MCC-1B Operational milestone was based upon completion of a combined MCC-1B and range scheduling and control (NET 2/3) IOT&E. Requirements of higher priority programs delayed completion of NET 2/3 and the IOT&E by approximately one year to 3rd Qtr FY 1992; however, MCC-1B development will still be complete 3rd Qtr FY 1991. Communications Segment baseline capabilities slipped from 3Q FY92 to 3Q FY93 due to delays in development of the Traffic Switching and Control Elements (caused by funds delay to FY93). These schedules reflect the currently baselined Command and Control Segment (CCS) Model Drops funded through PE 35110. Potential budget shortfalls in PE 35110 could delay the model drops, and thus delay CSOC program schedule.

Program Element: #0305130F Project Number: XXXI
Title: Consolidated Space Operations Center Budget Activity: #6-Defense Wide Mission Support

3. (U) Cost Changes: Investment funds beginning in FY 1993 were transferred to PE 0305110F, Satellite Control Facility; however, $5.9M FY 1992 RDT&E funds were delayed to FY 1993. FY 1992 3080 (other procurement) reduced.

F. (U) PROGRAM DOCUMENTATION:

- (U) Mission Element Need Statement (MENS) Sep 1979
- (U) Test and Evaluation Master Plan (TEMP) Annual Update Dec 1990
- (U) CSOC System Operational Requirements Document (SORD) Aug 1990

G. (U) RELATED ACTIVITIES:

- (U) Program Element 0702806F, Acquisition/Command Support
- (U) Program Element 0303112F, AF Communications
- (U) Program Element 0303126F, Long Haul Communications
- (U) Program Element 0305110F, Satellite Control Facility
- (U) Program Element 0804731F, General Skill Training
- (U) Program Element 0804772F, Training Development
- (U) Program Element 0805796F, Base Operations (Training)
- (U) Program Element 0305896F, Base Operations-AFSPACECOM
- (U) Program Element 0701112F, Inventory Control Pt. Operations
- (U) Program Element 0305894F, Real Property Maintenance
- (U) Program Element 0305165F, Global Positioning System
- (U) Program Element 0303603F, Milstar
- (U) Program Element 0702891F, Commissary/Retail Sales
- (U) Program Element 0807792F, Hospitals/Medical Clinics
- (U) There is no unnecessary duplication of USAF or DoD effort.

H. (U) OTHER APPROPRIATION FUNDS:

(U) Other Procurement (BA 83):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost*	996	6,456	16,176	15,719	Cont	TBD

* Four weapons systems codes are used to cover other procurement for CSOC, hardware, initial spares and replenishment spares

(U) Military Construction: Not applicable.

I. (U) INTERNATIONAL AGREEMENTS: None

J. (U) MILESTONE SCHEDULE:

1.	(U)	Construction Start	May 1983
2.	(U)	Facility Occupancy	Oct 1985
3.	(U)	GPS Master Control Station Operational	Jan 1986
4.	(U)	1st Cadre of Mission Controllers Complete Training	Jun 1987
5.	(U)	Mission Control Center 1A (MCC-1A) Operational	Dec 1989
6.	(U)	Mission Control Center 2 (MCC-2) Operational	3Q FY 1991
7.	(U)	Mission Control Center 1B (MCC-1B) Operational	3Q FY 1992
8.	(U)	Satellite Operations Complex (SOC) and NCS Turnover	4Q FY 1992
9.	(U)	Communications Segment Turnover and Full CSOC Turnover	3Q FY 1993

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305137F Project: # TBD
PE Title: National Airspace System (NAS) Budget Activity: #4 - Tactical Programs

Project Title: National Airspace System (NAS)

No Photo Available

POPULAR NAME: Not Applicable

A. (U) SCHEDULE/BUDGET INFORMATION ($ In Thousands):

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Major Contract		Dem/Val Contracts MAMS 5,100	MAMS 2,000	MAMS 3,404	TBD
Support Contract		MITRE 2,500 MM * 900	MITRE 1,000 MM * 900	MITRE 2,000 MM * 900	TBD
In-House Support		Logistics, Travel, SPO 1,600	Logistics, Travel, SPO 787	Logistics Travel, SPO 1,000	TBD
GFE/ Other		NAS Integration 4,498			TBD
Total	** 3,999	14,598	4,687	7,304	TBD
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones		MS 0-Nov 90 MS I-Sep 91	Milestone II		IOC - FY 98 FOC - FY 2003
Engineerng Milestones		MAMS Prototype			
T&E Milestones					Start Facility Testing FY 97
Contract Milestones		MAMS Prototype			Start Systems Acquisitions FY 94

* Martin-Marietta technical engineering management support.
** Funding contained in PE #0305114F, Air Traffic Control And Landing Sys.

Program Element: #0305137F Budget Activity: #4 - Tactical Programs
PE Title: National Airspace System (NAS)

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES:
The DOD National Airspace System program will modernize the DOD air traffic control (ATC) system in parallel with the FAA. DOD will acquire, to the maximum extent practical, systems on contract or systems to be on contract with the FAA to reduce development costs and prevent duplication. If the DOD does not modernize the DOD ATC system, the resulting reduced interoperability between current DOD and FAA facilities will negatively impact DOD flight operations. The DOD NAS program provides systems and facilities compatible/ interoperable with the FAA modernization, prevents DOD flight delays and cancellations, continues DOD's access into Special Use Airspace, provided transparent services to military and civil aircraft, replaces aging DOD ATC systems, and increases flight safety. DOD will upgrade voice, data, and sensor systems as well as facility configurations and operations concepts to provided continued quantity and quality of ATC services to the aviation community. DOD military ATC and fighting/flying readiness will be maintained. FY 90 NAS efforts funded under PE #0305114F, Air Traffic Control And Landing Systems (ATCALS).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments: Not Applicable.

2. (U) FY 1991 Planned Program:
   - (U) Continue DOD NAS Implementation Plan development initiated under PE #0305114F, ATCALS.
   - (U) Military Airspace Management System (MAMS) prototyping.
   - (U) Facility site surveys, environmental assessments.
   - (U) Tower/Remote-Tower RAPCON (T/RT) specification development for DOD facilities, part of the Advanced Automation System.
   - (U) Interfacility architecture development.
   - (U) Complete cost tradeoff studies and analyses.
   - (U) Radar and beacon (Mode-S) systems specification development.
   - (U) Voice Communications and Switching System (VCSS) definition.

3. (U) FY 1992 Planned Program:
   - (U) Continue MAMS prototyping.
   - (U) Continue site surveys. environmental assessments.
   - (U) Facility designs, transition planning, and specification development.
   - (U) Continue program definition and specification development for NAS systems..

4. (U) FY 1993 Planned Program:
   - (U) Continue MAMS development.
   - (U) Continue site surveys, facility planning.

Program Element: #0305137F Budget Activity: #4 - Tactical Programs
PE Title: National Airspace System (NAS)

5. (U) Program to Completion:
   - (U) Acquisition and installation, if appropriate, of the Advanced Automation System, Voice Communications Switching System, Mode S, ASR-10, and other systems in FY 94-2002.
   - (U) DOD ATC facilities modifications/construction starting in FY 95.
   - (U) IOC FY 1998.
   - (U) Integration of DOD NAS systems/facilities, FY 1998-2003.

D. (U) WORK PERFORMED BY: This program is managed by Electronic Systems Division, Hanscom AFB, MA. USAF is the lead Service and responsible for the management of the Joint Service program office. Contractor(s) are TBD. Developmental efforts for the NAS automation system, the airport surveillance radar, Mode S radar beacon system, and others are the responsibility of the FAA. Engineering support provided by MITRE Corp, Bedford, MA, and Martin-Marietta Corp, Washington, DC.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Not Applicable.
2. (U) SCHEDULE CHANGES: Based on the current FAA program, start of installations is scheduled to begin in FY 97.
3. (U) COST CHANGES: Not Applicable.

F. (U) PROGRAM DOCUMENTATION:
   - (U) Air Force Communications Command Statement of Need 04-87, National Airspace System Compatible Air Traffic Control Facilities, 27 Oct 87.
   - (U) Mission Need Statement, MAMS, JROCSM 88-099, 12 Dec 88
   - (U) Memorandum of Agreement Between the Federal Aviation Administration and the Department of Defense on Radar Approach Controls in the NAS, 14 Dec 88.
   - (U) Joint Requirements Oversight Council Mission Need Statement for NAS modernization, JROCSM 89-019-89, 17 May 89.
   - (U) DOD Directive 5030.19, DOD Responsibilities on Federal Aviation and NAS Matters, 22 Jun 89.
   - (U) Federal Aviation Administration NAS Plan, Sep 89.
   - (U) Joint Systems Operational Requirements Document (JSORD 001-85-I), Military Airspace Management System (MAMS), 21 May 90.
   - (U) NAS Acquisition Decision Memorandum, 13 Nov 90.
   - (U) Joint Systems Operational Requirements Document (JSORD 04-87), ATCALS for Terminal and Special Use Airspace in the NAS, 30 Nov 90

G. (U) RELATED ACTIVITIES:
   - (U) Part of the overall effort for the USAF acquisition of Air Traffic Control and Landing Systems (ATCALS) (PE #0305114F) including the Fixed Base Microwave Landing Systems (MLS), Commercial MLS Avionics, Mobile MLS, and Military MLS Avionics.

Program Element: #0305137F Budget Activity: #4 - Tactical Programs
PE Title: National Airspace System (NAS)

- (U) USAF lead agency for tri-service program working concurrently with the FAA.
- (U) Program Element #0604504N, Navy ATCALS.
- (U) Program Element #P665801.M44, Army ATCALS.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
None.		

T&E ACTIVITY (TO COMPLETION)

Event	Planned Date	Remarks
To Be Determined.		

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305138F
PE Title: Upper Stages Program

Budget Activity: #6 Defense Wide Mission Support

A. (U) RESOURCES: ($ in thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
0001 Upper Stage Development	0*	0*	5,957	4,143	Cont	TBD
Total	0*	0*	5,957	4,143	Cont	TBD

* An element of PE 0305171F through FY 1991, FY 90=$13.749M;FY 91=$4.129M

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Upper Stages Program was initiated to provide consolidated acquisition of upper stages to support the DOD Mission Model. The majority of the effort is in support of the Inertial Upper Stage (IUS). The effort includes: ground, launch and flight operations at the Eastern Launch Site (ELS), FL and support to flight operations at the Consolidated Space Test Center (CSTC); reimbursable acquisition and operations support of upper stages in support of NASA where appropriate and as documented in MOA/MOUs between USAF and NASA; centralized management for the definition of changes to the NASA Orbital Maneuvering Vehicle based on validated DOD user requirements; and continuous evaluation and improvement of upper stage reliability, cost effectiveness, and responsiveness.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 0001, Upper Stage Development. Provides quick response studies and analyses by the prime contractor in support of mission requirements. Effort includes improving mission effectiveness, anomaly testing and resolution, variance analyses, and resolution of problems during launch preparations. Provides independent verification and validation of flight software for each IUS vehicle prior to launch to insure there are no mission impacts caused by improper software.

(U) FY 1990 Accomplishments:
- (U) Provided studies/analyses in support of two DoD missions.
- (U) Provided independent verification and validation of IUS flight software for two DoD missions, including first IUS-Titan IV mission.
- (U) Provided technology assessment studies of future upper stage requirements.
- (U) Provided for design and development of new flight computer for next production of IUS vehicles.

Program Element: #0305138F
PE Title: Upper Stages Program

Budget Activity: #6 Defense Wide Mission Support

(U) FY 1991 Planned Program:
- (U) Provide quick response studies/analyses in support of two DoD missions.
- (U) Provide independent verification and validation of IUS flight software for two DoD missions.
- (U) Provide technology assessment studies of future upper stage requirements.

(U) FY 1992 Planned Program:
- (U) Provide studies/analyses in support of at least 1 DoD mission.
- (U) Provide technical analyses concurrent with the initiation of long lead for two IUSs (restart of production).
- (U) Provide technology assessment studies of future upper stage national requirements.

(U) FY 1993 Planned Program:
- (U) Provide studies/analyses in support of at least 1 DoD mission.
- (U) Provide technology assessment studies of future upper stage requirements.

(U) Work Performed By: The responsible Air Force agency is the Air Force Systems Command, Space Systems Division, Los Angeles AFB, CA. Systems engineering is provided by the Aerospace Corporation, El Segundo, CA. The prime contractor for the IUS, associated integration, engineering support and launch support is Boeing Aerospace and Electronics Company of Seattle, WA. Independent Verification of flight software is performed by Martin-Marietta Corporation of Denver, Co.

(U) Related Activities:
- (U) PE 0305144F, Titan IV Acquisition
- (U) PE 0102431F, Defense Support Program
- (U) PE 0303110F, Defense Satellite Communications System
- (U) NASA Space Transportation System
- (U) Various NASA scientific and communication satellites
- (U) PE 0305171F Space Shuttle Operations
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense

(U) Other Appropriation Funds:

(U) Missile Procurement (BA 5):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
(Cost)	10,320*	22,279*	61,523	130,325	Cont	TBD

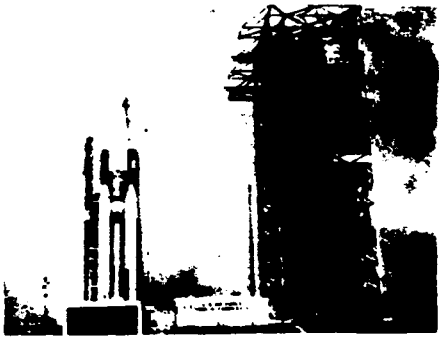
(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0305144F
PE Title: Titan IV Space Booster

Project: NA
Budget Activity: #6-Defense Wide Mission Support

Project Title: TITAN IV SPACE LAUNCH VEHICLE



POPULAR NAME: TITAN IV

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	TO COMPLETE
Major Contract	341,164	116,286	130,886	126,858	Continuing
Support Contract	4,400	4,600	6,000	6,200	Continuing
In-House Support	5,985	6,756	7,029	7,110	Continuing
GFE/ Other					Continuing
* PE TOTAL	0305119F Prior to FY92 351,449*	127,642*	143,915	140,168	Continuing
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	TO COMPLETE
Program Milestones		First West Coast Launch			
Engineering Milestones		TIV/No Upper Stage ILC VAFB First Centaur Flt	First Solid Rocket Motor Upgrade (SRMU) Flight	First Flt New Avionic Hardware	
T & E Milestones		SRMU Pre Qual Motor Firing	Complete SRMU Test Program		
Contract Milestones	Follow-on Buy(18 veh) Award TCLC Contract	Option (8 veh)			

Program Element: # 0305144F | Project: NA
PE Title: Titan IV Space Booster | Budget Activity: #6-Defense Wide Mission Support

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
National security requirements dictate a continuing, highly reliable means of placing critical Department of Defense satellites into required orbits. The Titan IV program provides the capability to launch the largest of these satellites into near-earth or geosynchronous orbits from either the east or west coast. This program is developing several different configurations for the Titan IV (no upper stage, inertial upper stage, and Centaur upper stage). In addition, the Titan program is developing an upgraded solid rocket motor and new programmable avionics ground equipment to meet reliability and range safety requirements. This program provides initial integration support to the payload community as well as continuing engineering support and post-flight engineering analysis to enhance the reliability of the Titan system. Titan IV performance, by configuration is summarized below:

CONFIGURATION	MISSION ORBIT	PERFORMANCE (to orbit)
Titan IV/Centaur/SRM	Geosynchronous	10,000 lbs
Titan IV/Centaur/SRMU	Geosynchronous	11,500 lbs**
Titan IV/IUS	Geosynchronous	5,000 lbs
Titan IV/NUS/SRM	Low Earth (Polar)	31,100 lbs
Titan IV/NUS/SRMU	Low Earth (Polar)	38,800 lbs

** Limited by Centaur Structural constraints

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Acomplishments:
- (U) Began modifications to Launch Complex-40 (LC-40) at CCAFS
- (U) Began design of Titan Centaur Launch Complex (SLC-6) at VAFB
- (U) Continued Centaur upper stage and SRMU development
- (U) Continued modifications to LC-41 at CCAFS
- (U) Began development of Programmable Avionics Ground Equipment (PAGE)

2. (U) FY 1991 Planned Program:
- (U) Complete construction of Solid Motor Assembly facility
- (U) Deliver first Centaur upper stage -- Dec 90
- (U) Launch first Titan IV from west coast -- 2QFY91
- (U) Launch first Titan IV/Centaur from east coast -- 4QFY91
- (U) Begin Solid Rocket Motor Upgrade (SRMU) qualification firing program -- Mar 91
- (U) Complete modifications to LC-41 at CCAFS -- Jul 91
- (U) Continue modifications to LC-40
- (U) Continue design of SLC-6
- (U) Continue payload integration activities for MILSTAR and DSP

3. (U) FY 1992 Planned Program:
- (U) Complete SRMU qualification program
- (U) Launch first Titan IV with SRMUs
- (U) Achieve TIV/IUS/NUS ILC at LC-40
- (U) Complete PAGE development
- (U) Begin Centaur Processing Facility AGE development
- (U) Continue payload integration activities for MILSTAR and DSP

Program Element: # 0305144F
PE Title: Titan IV Space Boosters

Project: NA
Budget Activity: #6-Defense Wide Mission Support

4. (U) FY 1993 Planned Program:
   - (U) Achieve TIV/Centaur ILC at LC-40
   - (U) Award contract for next increment of Titan IV
   - (U) Complete design and installation of Centaur Processing Facility AGE
   - (U) Continue payload integration activities for MILSTAR and DSP

5. (U) Program to Completion:
   - (U) This is a continuing program
   - (U) Continue flight assessment, reliability enhancement, and obsolete part replacement until all vehicles flown

D. (U) Work Performed By: The Program Executive Officer for Space is responsible for program management, with the program office located at Space Systems Division, Los Angeles AFB, CA. Systems engineering is provided by the Aerospace Corporation, El Segundo, CA. Prime Contractor for the Titan IV is Martin Marietta Corp, Denver, CO. Principal subcontractors include Aerojet Corp (Liquid engines), Sacramento, CA; McDonnell-Douglas Astronautics Corp (payload fairings), Huntington Beach, CA; Pratt and Whitney Chemical Systems Division (SRMs), Sunnyvale, CA; Hercules Industries (SRMUs), Magna, UT; General Dynamics Convair Division (Centaur), San Diego, CA; Bechtel Engineering (LC-40 modifications), St Louis, MO; and Honeywell (digital avionics), St Petersburg, FL. The contractor for SLC-6 is Lockheed Space Operations Corp, Sunnyvale, CA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Performance requirements for the SRMU configurations have been included. No schedule or cost changes due to this addition, since it has been on contract and funded.
2. (U) SCHEDULE CHANGES: The first SRMU qualification motor firing has slipped from Mar 90 to Mar 91 due to technical problems with the casing liner as well as an accident which occured at the test site. The ILC for SRMU has slipped, causing a breach of the schedule baseline.
3. (U) COST CHANGES: Program incurred overrun in RDT&E of $94 M thru FY91.

F. (U) PROGRAM DOCUMENTATION:
   - (U) National Space Policy, Jan 1988
   - (U) Program Decision Memorandum, 25 July 1988

G. (U) RELATED ACTIVITIES:
   - (U) Classified Space Programs*
   - (U) PE 0102431F Defense Support Program
   - (U) PE 0303603F Milstar
   - (U) PE 0305119F Space Boosters
   - (U) PE 0708022F SAMTO Test Range (ESMC)
   - (U) PE 0708032F SAMTO Test Range (WSMC)
   - (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense

* Reimburses Titan IV program for launch vehicle services.

Program Element: # 0305144F
PE Title: Titan IV Space Boosters

Project: NA
Budget Activity: #6-Defense Wide Mission Support

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands)
(U) Missile Procurement (BA5)

	FY 1990 Actual	FY1991 Estimate	FY1992 Estimate	FY1993 Estimate	To Complete	Total Program
Cost	190,299*	202,312*	292,657	339,178	continuing	continuing
(U) Other Procurement (BA83)						
Cost	0	0	0	0	255	45,847
(U) Military Construction						
Cost	89,000*	10,000*	24,000*	36,000*	0	178,200
Quantity	3	2	0	0	continuing	

* Funding for Titan IV prior to FY92 and all MILCON contained in PE 0305119F

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
SRMU Full-Scale Burst	14 Nov 89 - 17 May 90	Avg pressure exceeded required pressure by 43 psia. Success.

TEST ACTIVITY (TO COMPLETION)

Event	Planned Date	Remarks
Preliminary Qual Motor-1	Mar 91	Full-scale static motor firing If successful, cast QM-1
Qualification Motor QM-1	May 91	If successful, cast QM-3
QM-2	Aug 91	
QM-3	Oct 91	If successful, cast firstflight set
QM-4	Dec 91	Conduct flight readiness review following successful firing

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0305158F Budget Activity: #4 - Tactical Programs
PE Title: CONSTANT SOURCE

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
0001 CONSTANT SOURCE	0*	6714	8165**	7865**	Cont	TBD
Total	0	6714	8165	7865	Cont	TBD

* : FY 90 and prior years funds provided from classified programs.
** : SOF (MFP 11) RDT&E funding not included.

B. (U) BRIEF DESCRIPTION OF ELEMENT: PE established as part of the AF TENCAP normalization effort. Program

for mission planning and mission execution. This information enables air crews to effectively avoid, defeat or destroy enemy threat systems.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 0001, CONSTANT SOURCE: Efforts include development of a miniaturized airborne qualified multi-channel, multi-source capability

airborne and ground deployment.

(U) FY 1990 Accomplishments:
- (U) Continued development of the airborne qualified system.
- (U) Incorporated embedded correlation and Tactical Information Broadcast Service (TIBS) into the baseline system.
- (U) Upgraded and rebaselined correlation software.

(U) FY 1991 Planned Program:
- (U) Complete Advanced Development Model for airborne system.
- (U) Initiate FSD of the airborne system in 4th Qtr.
- (U) Update software and execute ECPs as required.
- (U) Acquire tech data to support logistics planning.
- (U) Prepare for a late FY93 production contract award.

(U) FY 1992 Planned Program:
- (U) Continue FSD of the airborne system (primary reason for increased funding requirements).
- (U) Update software and execute ECPs as required.
- (U) Commence integration R&D for SOF aircraft.
- (U) Conduct DT&E and prepare for IOT&E.

Program Element: # 0305158F Budget Activity: #4 - Tactical Programs
PE Title: CONSTANT SOURCE

(U) FY 1993 Planned Program:
- (U) Complete FSD of the airborne system.
- (U) Update software and execute ECPs as required.
- (U) Initiate IOT&E.
- (U) Award production contract for LRIP.

(U) Work Performed By: Top five contractors include Assurance Technology Corp., Alexandria, Virginia; BTG, Inc., Vienna, Virginia; Mnemonics, Inc., Melbourne, Florida; Harris Corp., Melbourne, Florida; Analytyx Electronic Systems, Boston, Massachusetts. Work is managed jointly by the Directorate of Communication and Intelligence Systems, Electronic Systems Division (ESD/IC), Hansom AFB, Massachusetts and the Navy's Tactical Systems Division, Space Technology Program, Space and Naval Warfare Systems Command (SPAWAR 004-2).

(U) Related Activities:
- (U) Program Element #0207247F, AF TENCAP
- (U) Program Element #0208019F, Tactical Cryptologic Activities
- (U) Program Element #0305159I, Defense Reconnaissance Support Program
- (U) Program Element #0305885G, Tactical Cryptologic Program
- (U) Program Element #0304111F, Special Activities
- (U) CONSTANT SOURCE formally interfaces with numerous national programs/agencies, the Major Commands and their components, the Air Staff, Office of the Secretary of Defense, Secretary of the Air Force, and the other Services in order to optimize the system's utility and to synchronize design efforts with other system developments.
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):

(U) Other Procurement (PE #0208019F, BA #4):

	FY 1990 Actual	FY 1991 Estimate	FY1992 Estimate	FY1993 Estimate	To Complete	Total Program
Cost	1962	0	0	0	0	5234

(U) Other Procurement (PE #0305158F, BA #4):

Cost	0	0	1935	27235	Cont	TBD

Note: - Funds procure off-the-shelf ground based equipment.
- SOF (MFP 11) funds programmed for airborne system procurements are not included.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305160F
PE Title: Defense Meteorological Satellite Program (DMSP)
Project: #XXX1
Budget Activity: 6-Defense Wide Mission Support

Project Title: DMSP



POPULAR NAME: DMSP

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands):

BUDGET	FY 1990	FY 1991	FY 1992	FY 1993	Program Total (To Complete)
Major Contract	39,713	39,439	19,507	16,809	Continuing
Support Contract	6,214	7,282	7,179	7,105	Continuing
In-House Support	1,515	1,483	1,511	1,508	Continuing
GFE/ Other	199	280	281	150	Continuing
Total	47,641	48,484	28,478	25,572	Continuing
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	TO COMPLETE
Program Milestones		F-10 & 11 Launch		Mark IVB PMRT	Milestone IV 2nd Qtr FY1996
Engineering Milestones	Titan II Launch Capability	Begin Blk 6 Risk Reduction		Mark IVB IOC	Begin Block 6 System Qual 1st Qtr FY1997
T&E Milestones			Mark IVB OT&E Oct 91		
Contract Milestone			Begin Mark IVB Prdctn 1Qtr 92		Final Mark IVB Delivery 4th Qtr FY 1995

Program Element: #0305160F Project: #XXX1
PE Title: Defense Meteorological Satellite Program (DMSP) Budget Activity: 6-Defense Wide Mission Support

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The DMSP is a fully operational Joint-Service program which supports all military services. Operational commanders require timely, quality weather information to effectively employ weapon systems and protect DOD resources. DMSP is the DOD's most important single source of global weather data. DMSP provides visible and infrared cloud cover imagery (1/3 nm constant resolution) and other meteorological, oceanographical and solar-geophysical information. These data are required over the entire earth in support of strategic and tactical operations. At least two satellites are required in sun synchronous 450 nm polar orbit at all times. (Sun synchronous means that the satellites cross the equator at the same local sun time on each of their 14 orbits/day). This program includes the spacecraft and sensors; ground command, control and communications (C^3) facilities and personnel; Air Force strategic and fixed and transportable tactical data receipt and processing terminals; and operations and maintenance. Through the next decade DMSP will gradually transition from Block 5D production to increasing effort on Block 6 development. This long lead time for satellite system development and production will allow significant risk reduction. Thus, Block 6 development will proceed in parallel with the current Block 5D efforts. DMSP will launch on Atlas-E launch vehicles through FY 1991, then transition to Titan II.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - -(U) Completed Titan II integration.
   - -(U) Continued system integration and test and sensor development, calibration and validation and related support activities.
   - -(U) Upgraded C^3 system encryption hardware and interfaces.
   - -(U) Closed Loring antenna site
   - -(U) Completed first phase of Block 6 competitive concept studies.

2. (U) FY 1991 Planned Program:
   - -(U) Begin Block 5D-3 launch facility upgrades.
   - -(U) Continue system integration and test and sensor development, calibration and validation and related support activities.
   - -(U) Complete Mark IVB development.
   - -(U) Deliver the first Block 5D-3 satellite (S-15).
   - -(U) Award two parallel competitive Block 6 advance development contracts for technology risk reduction.

3. (U) FY 1992 Planned Program:
   - -(U) Finish Block 5D-3 launch facility upgrades.
   - -(U) Transition to Titan II launch vehicle.
   - -(U) Continue system integration and test and sensor development, calibration and validation and related support activities.
   - -(U) DMSP Enhancement at New Hampshire Tracking Station complete.
   - -(U) Complete Mark IVB IOT&E and begin Mark IVB production.
   - -(U) Continue Block 6 advance development contracts for technology risk reduction.

Program Element: #0305160F Project: #XXX1
PE Title: Defense Meteorological Satellite Program (DMSP) Budget Activity: 6-Defense Wide Mission Support

4. (U) FY 1993 Planned Program:
   -(U) Continue system integration and test and sensor development,calibration and validation and related support activities.
   -(U) Continue Mark IVB production.
   -(U) Continue Block 6 advance development contracts for technology risk reduction.

5. (U) Program to Completion:
   -(U) This is a continuing program.
   -(U) Continue Mark IVB production into FY 1995.
   -(U) Continue Block 6 risk reduction through FY 1996, down select to one prime contractor and begin System Qualification/Initial production in FY 1997 after the completion of Milestone review.

D. (U) WORK PERFORMED BY: Development and procurement are managed by Space Systems Division, Air Force Systems Command (AFSC), Los Angeles AFB CA. Major contractors include: General Electric, Astro Space Division, East Windsor NJ (spacecraft, and satellite integration); Westinghouse Electric Corporation, Baltimore MD (primary cloud imaging sensor); Aeroject Electro-system Azuza CA (microwave sounders); Harris Corporation, Melbourne FL (ground systems); and Lockheed Missiles & Space Company, Austin, TX (Mark IVB).

E. (U) COMPARISON WITH FY 1990/91 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: None

2. (U) Schedule Changes: Slip in Mark IVB IOT&E and production decision from mid FY91 to early FY92 due to added technical effort and software and antenna development problems.

3. (U) Cost Changes: Due to continued and projected on-orbit success of current satellites, Block 6 development was slowed, reducing FY92 and FY93 funding.

F. (U) PROGRAM DOCUMENTATION:

(U) Joint-Service MOA (USAF/USN/USA/DOD), 15 Dec 76
(U) MAC SON 508-78, 28 Dec 78
(U) MAC SON 01-83, 17 Mar 83
(U) AFSPACECOM SON 07-84, 3 Jun 85
(U) JCS Requirements Memorandum 154-86, 1 Aug 86
(U) MAC SON 02-80, 14 Feb 86
(U) TEMP, 22 Jan 88
(U) MAC SON 505-79, 8 Sept 88
(U) SORD, 26 Dec 90

G. (U) RELATED ACTIVITIES:
(U) DMSP is a Joint-Service program in accordance with the above for the MOA. The Air Force is the Executive Agent with responsibility for the Space, C^3, and Air Force User Segments. Each Service funds its

Program Element: #0305160F Project: #XXX1
PE Title: Defense Meteorological Satellite Program (DMSP) Budget Activity: 6-Defense Wide Mission Support

own User Segment and any Service unique changes to other segments.

(U) Program Element #0305160N, DMSP, Navy jointly funds microwave imager procurement with the Air Force. Navy also developing and procuring 73 SMQ-11 shipboard and shore based tactical terminals.

(U) The Marine Corps procured 12 Mark IV tactical terminals.

(U) Army, Navy, and Air Force user representatives are integrated into the program office to insure close coordination.

(U) Close coordination is maintained with the civilian weather satellite programs of the Department of Commerce (DOC). The DOD and DOC systems have different missions and sensors. Interchange of technology and joint efforts have been continuous, with special emphasis on avoiding duplication of effort.

(U) Program Element #0305119F, Space Boosters Program, provides Atlas-E and Titan II launch services.

(U) Program Element #0305163F, DMSP Communications, leased communications.

(U) Navy and Army jointly funded Block 6 studies.

(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

(U) Missile Procurement (BA 23):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	135,801	147,719	108,052	7,302	Cont.	TBD
Quantity	1	1	2	0		

(U) Other Procurement (BA 83)(includes spares):

Cost	1,366	19,874	24,934	21,699	Cont.	TBD

(U) Military Construction: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
F-9 On-orbit Checkout and Turnover to AFSPACECOM	Feb 88	Fully Operational
Microwave Imager Calibration/Validation	FY 87-FY 89	Data Quality Exceeding Rqmts Minor Thermal Problems
Fairchild SOC OT&E	May 89	Fully Operational
F-10 On-Orbit Checkout and Turnover to AFSPACECOM	Jan 91	Fully Operational

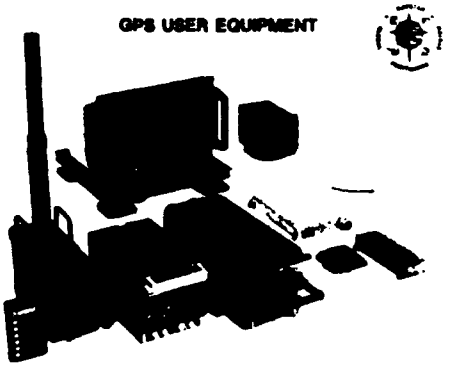
T&E ACTIVITY (TO COMPLETION)

Mark IVB OT&E	Oct 91

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305164F
PE Title: Navstar Global Positioning System (GPS) User Equipment
Project Number: # N/A
Budget Activity: 5-Intelligence and Communications

Project Title: GPS



POPULAR NAME: GPS

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET	FY 1990	FY 1991	FY 1992	FY 1993	Program Total
Major Cont	26,312	8,433	10,747	19,714	Continuing
Spt Contract	3,550	3,040	2,560	2,560	Continuing
In House Spt	1,026	840	800	800	Continuing
GFE/Other	1,733	300	300	400	Continuing
Total	32,621	12,613	14,407	23,474	N/A
Schedule	FY1990	FY1991	FY1992	FY1993	To Complete
Program Milestones	N/A	PMRT 3Q91	Milestone IIIB Nov91 User Equip	N/A	Production continues thru 1990s
Engineering Milestones	N/A	N/A	N/A	N/A	N/A
T&E Milestones	Completed User Equip OT&E (5 Ch) Dec 89	Additional UE OT&E 1/91-5/91	N/A	N/A	N/A
Contract Milestones	LRIP continues	LRIP option award Mar 91	Full rate prod opt 2Q 92	Full rate prod opt 2Q 93	Rate prod options continue

Program Element: #0305164 Project Number: # N/A
PE Title: Navstar Global Positioning System (GPS) User Equipment Budget Activity: 5-Intelligence and Communications

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program element funds Research and Development to integrate Navstar Global Positioning System (GPS) user equipment into Air Force airborne and ground platforms. Military forces need precise location data to enhance command and control and to engage in strategic and tactical warfare. The GPS satisfies these requirements and improves strategic target mapping, the probability of target acquisition, flexible routing, low-level ingress/egress, and accuracy of weapons delivery. GPS is a space based navigation system which provides highly accurate position, velocity and time. GPS consists of three segments. The space segment (funded in PE 0305165F) is the satellite constellation which provides the worldwide navigation signals. The control segment (also funded in PE 0305165F) measures and corrects satellite performance parameters and provides a user interface to the system. The user equipment segment consists of the electronic equipment and interfaces necessary to receive and process GPS satellite signals into position, velocity and time data for its various military uses.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Other previous integration development activities continued.
   - (U) Integration development began for C-5, OV-10, and B-1B family aircraft.
   - (U) Continued development of mission planning system.
   - (U) Began development of Integrated Support Facility for UE software.

2. (U) FY 1991 Planned Program:
   - (U) Continue other previously initiated integrations and development activities.
   - (U) Initiate integration on CSAM (Special Air Mission, C-20 type VIP transport) and T-1A aircraft.
   - (U) Continue development of mission planning system.
   - (U) Continue development of Integrated Support Facility.
   - (U) Awarded Miniaturized Airborne GPS Receiver (MAGR) contract.

3. (U) FY 1992 Planned Program:
   - (U) Continue other previously initiated integrations.
   - (U) Initiate integration on F-117 and B-52H.
   - (U) Continue development of mission planning system.
   - (U) Continue development of Integrated Support Facility.
   - (U) Deliver and test MAGR engineering development hardware.

4. (U) FY 1993 Planned Program:
   - (U) Continue other previously initiated integrations.
   - (U) Support developmental testing of aircraft integrations.
   - (U) Complete development of software integrated support facility.
   - (U) Initiate development of user equipment upgrades to allow operation after loss of ground control segment.

Program Element: #0305164 Project Number: # N/A
PE Title: Navstar Global Positioning System (GPS) User Equipment Budget Activity: 5-Intelligence and Communications

5. (U) Program to Completion:
   - (U) Continuing program. Efforts will continue beyond the year 2000 to integrate GPS into Air Force aircraft for world wide navigation in lieu of other radionavigation systems.

D. (U) WORK PERFORMED BY: The acquisition of GPS is managed by a Joint Program Office located at the Air Force System Command's Space Systems Division, Los Angeles AFB, CA. User equipment is produced by Rockwell International, Collins Government Avionics Division, Cedar Rapids, IA. Intermetrics, Cambridge, MA, is the user equipment software independent verification/validation contractor. The Naval Air Development Center, Warminster, PA; the Naval Avionics Center, Indianapolis, IN; and the Army Avionics Research and Development Activity, Ft Monmouth, NJ, are providing technical and validation support to the program office for joint service user equipment development and production.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None

2. (U) SCHEDULE CHANGES: Milestone IIIB full rate production decision for user equipment delayed from Jul 90 to Nov 91 to allow additional operational testing to satisfy DOT&E test requirements. Will continue LRIP for FY90 and FY91. Contracts awarded Sep 90.

3. (U) COST CHANGES: GPS installation delayed for the B-1B, A-10, F-15, F-16 A/B, FB-111, C-5, T-37, T-38, C-135, C-137, KC-10, and VIP transports due to budget reductions. Therefore, integration funding for these aircraft is not required in FY92/93.

F. (U) PROGRAM DOCUMENTATION:
   - (U) DCP 133 (Rev A), 17 Jan 78
   - (U) SDDM, 11 Jul 86
   - (U) Integrated Multi-Service TEMP, Jan 1991
   - (U) SORD January 1990
   - (U) Navstar GPS Baseline, 22 Dec 89

G. (U) RELATED ACTIVITIES:
   - (U) GPS development and operational implementation are joint activities
   - (U) Other agencies are the Army, Navy, Marine Corps, Defense Mapping Agency, Department of Transportation and North Atlantic Treaty Organization (NATO)
   - (U) Coordination obtained through a Joint Program Office.
   - (U) PE 0603601F, Conventional Weapon Technology, explores use of GPS to provide guidance corrections for tactical missiles.
   - (U) PE 0101221N, Fleet Ballistic Missile Systems, range positioning.
   - (U) PEs 0301357F and 0102433F, Nuclear Detonation Detection System (NDS), fund NDS payloads on the GPS satellites.
   - (U) PE0305165F, Navstar GPS (Space/Ground), provides the satellites and control capability to produce signals used by the user equipment for positioning, navigation and timing.

Program Element: #0305164 Project Number: # N/A
PE Title: Navstar Global Positioning System (GPS) User Equipment Budget Activity: 5-Intelligence and Communications

- (U) PE 0305119F Space Boosters, funds launch services (Delta II).
- (U) PE 0305130F, Consolidated Space Operations Center (CSOC), funds CSOC which hosts the operational GPS Master Control Station.
- (U) No unnecessary duplication of effort within the Air Force or DOD.

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands)

1. Procurement:

	FY 1990 Actual	FY 1991 Estimate	FY1992 Estimate	FY1993 Estimate	To Complete	Total Prog
Aircraft Procurement (BP 11, 16, 19)						
Funds	84,290	40,366	107,358	75,912		
Quant. (Receivers)	(195)	(119)	(602)	(881)	Cont.	Cont.
Other Procurement (BA 83)						
Funds	9,739	1,635	4,920	11,088	Cont.	Cont.
Quant. (Manpacks)	(146)	(0)	(60)	(145)		

2. Military Construction: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: In April, 1978, a Memorandum of Understanding (MOU) was signed with nine NATO allies and with Australia to permit NATO and Australian participation in the development of GPS user equipment. The MOU created an international team at the US Joint Program Office (JPO), with each nation providing representatives. Nations involved included Britain, Norway, the Netherlands, Italy, Germany, France, Denmark, Canada, Belgium and Australia. Also, during 1987, Spain became the tenth NATO signatory to the MOU. Allied personnel are fully integrated into the user equipment, program management, and applications areas of the JPO.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
OT&E	Jul-Dec 89 (AF/Navy)	Met major test objectives. Additional reliability testing required due to mean time between failure issues on Navy submarine.

T&E ACTIVITY (TO COMPLETION)

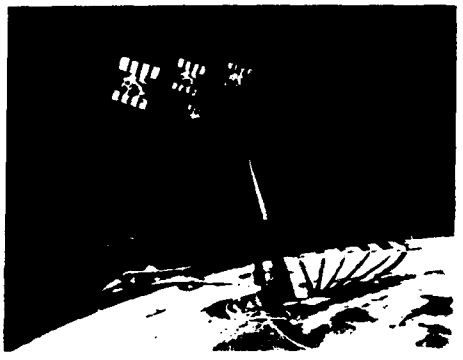
Event	Date	Results
OT&E	Additional Navy and AF OT required to prove MTBF requirements have been met. Test dates: 2QFY91-3Q FY91.	

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305165F
PE Title: Navstar Global Positioning System (GPS) Space/Control

Project Number: # N/A
Budget Activity: 5-Intelligence and Communications

Project Title: GPS



POPULAR NAME: GPS

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET	FY 1990	FY 1991	FY 1992	FY 1993	Program Total
Major Cont	25,143	39,425	47,339	41,396	Continuing
Spt Contract	2,366	2,851	1,271	1,268	Continuing
In House Spt	1,698	2,454	2,303	1,861	Continuing
GFE/Other	3,656	2,278	1,092	1,172	Continuing
Total	32,863	47,008	52,005	45,697	N/A
Schedule	FY1990	FY1991	FY1992	FY1993	To Complete
Program Milestones	Continue Production Satellite Launches	N/A	18 Prod Satellites On orbit May 92	3-D Coverage Nov 92	N/A
Engineering Milestones	Block IIR CDR Sep 90	Control software CDR	N/A	N/A	N/A
T&E Milestones	Cntrl Seg Phase I IOT&E 10/89-12/89	Cntrl Seg Phase II IOT&E 5/91-7/91	N/A	Cntrl Seg Phase III IOT&E	N/A
Contract Milestones	N/A	IIR Long Lead Cont Award Oct90	Begin IIR Sat Prod FY 92	N/A	Deliver First Block IIR Sat 1995

Program Element: #0305165F
PE Title: Navstar Global Positioning System (GPS) Space/Control

Project Number: # N/A
Budget Activity: 5-Intelligence and Communications

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES

This program element funds Research and Development for the Navstar Global Positioning System (GPS) space and control segments of the overall GPS program. This includes: satellite development, procurement, deployment, operation of the ground control segment; upgrades to improve survivability of both the space and ground segments; and R&D efforts to support deployment of the entire GPS system. Military forces need precise location data to enhance command and control and to engage in strategic and tactical warfare, especially at night and in adverse weather. The GPS satisfies these requirements. GPS is a space based radio positioning and navigation system which provides highly accurate three-dimensional position (16 meter spherical error probable), velocity (0.1 meter/second) and time (within 0.1 microsecond). These capabilities, coupled with the inherent feature of highly accurate silent user operation, enhance the force effectiveness and survivability of many U.S. weapon systems. GPS consists of three segments. The space segment is the satellite constellation which provides the worldwide navigation signals. GPS satellites will also carry Nuclear Detonation (NUDET) Detection System sensors as additional payloads. The control segment measures and corrects satellite performance parameters and provides a user interface to the system. It consists of five monitor stations and three ground antennae located around the world and a Master Control Station (MCS) at Falcon AFB CO. The user equipment segment (funded by PE 0305164F) consists of the electronic equipment and interfaces necessary to receive and process GPS satellite signals into position, velocity and time data for its various military uses.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Operational satellite launches continued, with nine production satellites on orbit by end of FY. Provides 14-22 hours of 3-dimensional navigation coverage (with R&D satellites).
   - (U) Development of GPS replenishment satellites continued. Completed satellite CDR in September.
   - (U) Control segment support to on-orbit constellation continued.
   - (U) Prototype of constellation management/status reporting system delivered to control segment and one user node.
   - (U) Completed Phase I IOT&E testing of space/control segment.
   - (U) Completed OCS turnover to AFSPACECOM.
   - (U) Completed PDR for update to ground control software.

2. (U) FY 1991 Planned Program
   - (U) Operational satellite launches/on-orbit support continue.
   - (U) Complete replenishment satellite design; begin piece part qualification and test development hardware. Procurement of replenishment satellites will begin.

Program Element: #0305165F
PE Title: Navstar Global Positioning System (GPS) Space/Control

Project Number: # N/A
Budget Activity: 5-Intelligence and Communications

- (U) Initial capability will be in place for constellation management/system status reporting.
- (U) Begin upgrade to ground control software to support Block IIR satellites.
- (U) Complete CDR and formal qual test for update to ground control software.

3. (U) FY 1992 Planned Program:
   - (U) Complete qualification testing of first Block IIR satellite.
   - (U) Continue upgrade to ground control software (approximately 200,000 lines of code) to support Block IIR satellites.
   - (U) Upgrade mainframe computers to support Block IIR satellites.
   - (U) Continue upgrade of control segment required by AFSC/AFLC turnover agreement.

4. (U) FY 1993 Planned Program:
   - (U) Refurbish first Block IIR satellite used for qualification.
   - (U) Continue upgrade to ground control software to support Block IIR satellites.
   - (U) Continue upgrade of control segment required by AFSC/AFLC turnover agreement.

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

D. (U) WORK PERFORMED BY: The acquisition of GPS is managed by a Joint Program Office under the PEO/Space, located at Los Angeles AFB, CA. The Block II satellite contractor is Rockwell International, Seal Beach, CA. ITT, Nutley, NJ, and Rockwell International, Autonetics Strategic Systems Division, Anaheim CA, are the subcontractors for the navigation subsystems. General Electric, East Windsor, NJ was competitively selected in June 89 to develop and produce the Block IIR satellites. Operational control segment development and deployment is being done by IBM, Federal Systems Div., Gaithersburg, MD. User equipment is produced by Rockwell International, Collins Government Avionics Division, Cedar Rapids, IA and SCI, Huntsville AL.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None

2. (U) SCHEDULE CHANGES: Block IIR CDR delayed three months due to late startup of major subcontractors. CDR completed Sep 90. No impact to overall satellite delivery schedule.

3. (U) COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION:
   - (U) DCP 133 (Rev A), 17 Jan 78
   - (U) SORD, January 1990

Program Element: #0305165F | Project Number: # N/A
PE Title: Navstar Global Positioning System (GPS) Space/Control | Budget Activity: 5-Intelligence and Communications

G. (U) RELATED ACTIVITIES:
- (U) GPS development and operational implementation are joint activities
- (U) Other agencies are the Army, Navy, Marine Corps, Defense Mapping Agency, Department of Transportation and NATO.
- (U) Coordination obtained through a Joint Program Office.
- (U) PE 0305164F, Navstar GPS (User Equipment), provides receivers to use the positioning, navigation and timing signals from satellites.
- (U) PE 0101221N, Fleet Ballistic Missile Systems, range positioning.
- (U) PEs 0301357F and 0102433F, Nuclear Detonation Detection System (NDS), fund NDS payloads on the GPS satellites.
- (U) PE 0305119F Space Boosters, funds launch services (Delta II).
- (U) PE 0305130F, Consolidated Space Operations Center (CSOC), funds CSOC which hosts the operational GPS Master Control Station.
- (U) No unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands)

(U) Missile Procurement (BA23, P-35)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	Total Program
Cost (satellites)	42,000	180,667	216,086	261,703	N/A
Quantities (Order/ Full Fund)	(0/0)	(0/0)	(4/4)	(6/6)	
Other Procurement (BA 83, P-120)					
Cost	0	0	2,007	2,041	N/A

(U) Military Construction: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
Control Segment Software IOT&E	Oct 89 - Dec 89	Verified Control Segment capability to control satellite constellation.

T&E ACTIVITY (TO COMPLETION)

Event	Date	Results
Control Segment Follow on OT&E	1991 & 1993	

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305171F Budget Activity: 6 - Defense Wide Mission Support
PE Title: Space Launch Support (formerly Space Shuttle Operations)

A. (U) RESOURCES ($ In Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
0001	47,730	16,574	0*	0*	Complete	234,171

* Upper Stages transferred to PE #0305138F in FY 1992 and beyond, refer to the Descriptive Summary for that PE for funding.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Department of Defense places heavy reliance on its space assets to accomplish its strategic, tactical, and airlift missions. Requirements include such capabilities as communications, navigation, weather, early warning, and surveillance. Access to space is required for these space assets to perform their respective missions. The Space Launch Support program provides the Space Transportation resources needed to transport Air Force space payloads to their mission orbits. Main program objectives are to provide consolidated management, programming, and execution of Air Force Space Shuttle missions, Inertial Upper Stages (IUS), upper stage programs and the Vandenberg Shuttle Launch and Landing Site (VLS). DOD use of the Space Transportation System (STS) is paid for in the form of Orbiter Flight Charge reimbursement made to NASA one year prior to the scheduled launch date, but agreed to three years in advance. Beginning in FY 1992, the Upper Stages program was transferred to a separate program element #0305138F. In addition, with the decision to convert Space Launch Complex-6 (SLC-6) to the second Titan Launch Complex on the West Coast, support of the Vandenberg Shuttle Launch and Landing Complex is no longer required.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) DOD flew two of three planned dedicated Shuttle missions
     -- Provided secure operations at all NASA centers
   - (U) DOD flew secondary payloads on Shuttle
   - (U) No Orbiter flight charge payment to NASA (used 3 of 4 flight credits due to DOD -- 1 remains)

Program Element: #0305171F
PE Title: Space Launch Support

Budget Activity: 6 - Defense Wide Mission Support

- (U) VLS sustained in "mothball" status
  -- Alternate users financially responsible for any operations and maintenance expenses
- (U) Planned for phase out of secure operations at NASA centers after last secure DOD mission

2. (U) FY 1991 Planned Program:
   - (U) Fly three dedicated DOD Shuttle missions to support the Space Test Program, SDIO and other users
     -- Provide integration support for STS-39 and STS-44
   - (U) Fly DOD secondary payloads on Shuttle
   - (U) Use last DOD Shuttle flight credit
   - (U) Transfer VLS to Titan IV program
   - (U) Phase out secure operations at NASA centers

3. (U) FY 1992 Planned Program:
   - (U) Phase out AF Consolidated support to DOD Shuttle Missions

4. (U) Program to Completion:
   - (U) Program complete

D. (U) WORK PERFORMED BY: The responsible Air Force agency is the Air Force System Command's Space Division, Los Angeles, CA. Systems engineering is provided by the Aerospace Corporation, El Segundo, CA. The Shuttle integration contractor is Rockwell Corporation, Downey, CA. The National Aeronautics and Space Administration is the Shuttle manager with major interfaces at Kennedy Space Center, FL and Johnson Space Center, TX. The Vandenberg Shuttle contractor is Lockheed Space Operations Company, Titusville, FL.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: Delete Consolidated AF Support to Shuttle Missions beginning in FY 1992
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION:
   (U) NASA Dec 1990 Payload Flight Manifest

G. (U) RELATED ACTIVITIES:
   (U) Program Element # 0305138F Upper Stages Program
   (U) Program Element # 0603402F Space Test Program
   (U) Program Element # 0102431F Defense Support Program
   (U) Orbiter Flight Charges for other Department of Defense programs in their program element

Program Element: #0305171F
PE Title: Space Launch Support

Budget Activity: 6 - Defense Wide Mission Support

(U) DOD Shuttle usage coordinated by Space Launch Advisory Group (SLAG) (Joint service/agency group)
(U) There is no unnecessary duplication within the Air Force or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ In Thousands)
(U) Missile Procurement (BA 5)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	29,111	23,128	0*	0*	Program Complete	

* Upper Stages transferred to PE #0305138F in FY 1992 and beyond, refer to the Descriptive Summary for that PE for their funding

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) MILESTONE SCHEDULE:

	DATE
* Last Secure Shuttle Mission (NASA Milestone)	NOV 1990

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305887F Budget Activity: #4 - Tactical Programs
PE Title: Electronic Combat Intelligence Support

A. (U) RESOURCES ($ in Thousands)

Project Number	Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2907	Electronic Combat (EC) Intelligence Support	1,744	1,824	1,858	1,878	Continuing	TBD
Total		1,744	1,824	1,858	1,878	Continuing	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This project continues to support Air Force electronic combat (EC) operations and aircrew training through the validation of threat emitter simulators (SIMVAL).

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993

(U) 1. Project 2907, Electronic Combat Intelligence Support: The SIMVAL program evaluates the accuracy of threat emitter simulators to electronically replicate actual hostile emitters.

(U) FY 1990 Accomplishments:
- (U) Provided validation reports for the AFEWES TWS-4, REDCAP IADS, BMC3, AMRAAM threat simulators, five ESAMS digital simulations, and other Air Force simulators.

(U) FY 1991 Planned Program:
- (U) Will provide design specification, design, and acquisition validation reports for Air Force threat simulators being developed by AFEWES, REDCAP, the Range Improvement Program, and the Air Force Logistics Centers.
- (U) These reports will fulfill the validation requirements levied on the Air Force simulator development programs by OSD through the CROSSBOW-S Committee.
- (U) validations are required in FY91.

(U) FY 1992 Planned Program:
- (U) Continue SIMVAL effort to validate simulators as required by OSD CROSSBOW-S Threat Simulator Committee.
- (U) Produce design specification, design, and acquisition validation reports.
- (U) Ensure that threat simulators accurately replicate foreign electronic combat threats for USAF weapon system development and aircrew training.

(U) FY 1993 Planned Program:
- (U) Continue SIMVAL effort to validate simulators as required by OSD CROSSBOW-S Threat Simulator Committee.
- (U) Produce design specification, design, and acquisition validation reports.
- (U) Ensure that threat simulators accurately replicate foreign EC threats for USAF weapon system development and aircrew training.

Program Element: #0305887F Budget Activity: #4 - Tactical Programs
PE Title: Electronic Combat Intelligence Support

- (U) This is a continuing program, validating systems based on a CROSSBOW-S prioritized tasking list. This effort supports all threat simulator development programs.
- (U) Ensure that system designers and engineers have a validated threat baseline from which to develop simulators and digital simulations.
- (U) Ensure that aircrews train with the most accurate threat simulators available. This will increase aircrew/airframe survivability, effective and efficient disposition of high cost ordnance, and boost mission success rates.

(U) Work Performed By: The Foreign Technology Division (FTD) at Wright-Patterson AFB, Ohio, performs SIMVAL tasks, using in-house and contract resources. FTD does threat SIMVAL program tasks with the assistance of radar engineers from Sverdrup Technology, Inc. of Tulahoma, Tennessee, through their Dayton, Ohio and Shaliman, Florida offices.

(U) Related Activities:
(U) This program supports and directly interfaces with other EC projects within PE 0305887F.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):
(U) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0401840F Project: N/A
PE Title: Military Airlift Command Command & Control (MAC C2) Budget Activity: #4 - Tactical Programs
Project Title: Information Processing System (IPS)

NO PICTURE AVAILABLE

POPULAR NAME: MAC C2 IPS

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Major Contract	8,041	9,049	8,924	8,801	(TBD)
Support Contract	1,858	2,019	2,420	2,714	(TBD)
In-House Support	197	200	226	287	(TBD)
GFE/ Other	235	92	0	0	(TBD)
Total	10,331	11,360	11,570	11,802	23,679
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	(To Complete)
Program Milestones	N/A	AISARC II/ III Jul 91 IOC-Aug 91	N/A	N/A	FOC FY 96
Engineering Milestones	N/A	N/A	Crit. Design Rev. Incr 2 Mar 92	N/A	Crit. Design Review Incr 3 FY 3/94
T&E Milestones	DT&E Incr 1 Started Aug 90	IOT&E Incr 1 Starts Jun 91	DT&E Incr 2 Starts May 92	IOT&E Incr 2 Jan 93; DT&E Inc 3 Mar 93	IOT&E Incr 3 FY 4/94
Contract Milestones	N/A	S/W Spec Review Inc 2 May 91	N/A	S/W Spec Review Inc 3 Jan 93	N/A

Program Element: #0401840F Project: N/A
PE Title: Military Airlift Command Command & Control (MAC C2) Budget Activity: #4 - Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The Information Processing System (IPS) develops and procures basic communications and information processing hardware and software for all echelons of the Military Airlift Command (MAC) C2 system. It satisfies essential elements of the MAC C2 architecture validated in MAC Statement of Need 3-81. The integration of IPS computer resources and software with improved High Frequency (HF) equipment, new UHF satellite networks, and other available communications media will result in a unified MAC command and control system. The IPS will be developed and installed in three increments. Increment I will provide a digital data message handling capability at each IPS node and implement mission execution monitoring. Increment II will build on Increment I software to support mission planning and scheduling. Increment III will augment the planning and scheduling capabilities of Increment II as well as install UHF and VHF communications interfaces.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Completed Software Specification Review (SSR), Preliminary Design Review (PDR), and Critical Design Review (CDR) for Increment 1.
   - (U) Continued software development of Increment 1.
   - (U) Conducted site survey of 11 locations and 13 nodes.
   - (U) IOT&E hardware (3 nodes) was procured and installed at McGuire AFB.
   - (U) IOT&E training was interrupted by Desert Shield.
   - (U) Initiated development and procurement of 7 systems to support Desert Shield.

2. (U) FY 1991 Planned Program:
   - (U) Complete development, procurement and fielding of 7 additional systems to support Desert Shield (14 total for Desert Shield).
   - (U) Conduct IOT&E, Increment 1.
   - (U) Initiate Increment 2 software development.
   - (U) Conduct AISARC II/III Review.
   - (U) Procure system for 16 non-Desert Shield nodes (Increment 1 software).

3. (U) FY 1992 Planned Program:
   - (U) Conduct Increment 2 PDR and CDR.
   - (U) Complete Increment 2 software development.
   - (U) Procure system for 19 nodes (Increment 1 software).

4. (U) FY 1993 Planned Program
   - (U) Conduct Increment 2 IOT&E.
   - (U) Initiate Increment 3 software development.
   - (U) Procure system for 33 nodes (Increment 2 software).
   - (U) Upgrade software at 54 previously installed nodes to Increment 2 software.

Program Element: #0401840F Project: N/A
PE Title: Military Airlift Command Command & Control (MAC C2) Budget Activity: #4 - Tactical Programs

5. (U) Program to Completion:
   - (U) Complete Increment 3 software development and conduct IOT&E.
   - (U) Procure and install system at remaining 45 nodes.
   - (U) Upgrade all nodes to Increment 3 software.
   - (U) Achieve Full Operational Capability in FY96.

D. (U) WORK PERFORMED BY: The IPS contractor is Computer Sciences Corporation (CSC), Moorestown, New Jersey.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: An early operational capability was fielded to support Desert Shield. This effort was designated "HAVE IPS."

2. (U) SCHEDULE CHANGES: Due to Desert Shield and the fielding of HAVE IPS to 14 locations, IPS development was delayed approximately 5 months.

3. (U) COST CHANGES: Due to budget reductions, FY 93 and outyear 3080 funding was reduced which limits our planned buy rate and deployment schedule. Deployment for FY 91 was also reduced per Congressional direction in the FY91 3080 Authorization. This results in fewer IPS nodes fielded than originally planned. Overall, funding for IPS systems is insufficient to meet MAC's total requirement.

F. (U) PROGRAM DOCUMENTATION:

- (U) MAC SON 3-81 Mar 81
- (U) PMD 4040(7)/41840F Feb 90

G. (U) RELATED ACTIVITIES:

(U) Program Element #0303605F, Ultra High Frequency (UHF) Satellite Terminal System.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
(U) JPD to be determined at Milestone III.

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

(U) Procurement: PE 0401840F/(BA4)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	4,085	6,531	7,178	20,422	58,437	96,653
Quantity*	10	23	19	33	57	142

* Unit cost depends on procured IPS configuration. FY93 funding includes upgrade to 5 previously installed nodes. To Complete funding includes upgrade to 32 previously installed nodes.

Program Element: #0401840F Project: N/A
PE Title: Military Airlift Command Command & Control (MAC C2) Budget Activity: #4 - Tactical Programs

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
DT&E Inc 1	Aug 90 - Present	DT&E efforts were rephased to facilitate fielding an early IPS capability to support Desert Shield. MAC "Quick Look" assessment (3-14 Jan 91) identified deficiencies which require resolution prior to deployment. Development actions on-going to correct deficiencies.

T&E ACTIVITY (TO COMPLETION)

Event	Planned Date	Remarks
IOT&E Inc 1	Jun 91	Delayed 5 months due to Desert Shield support
DT&E Inc 2	May 92	
IOT&E Inc 2	Jan 93	
DT&E Inc 3	Mar 93	
IOT&E Inc 3	Aug 94	

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0404011F Budget Activity: #4 - Tactical Programs

PE Title: Special Operations Forces (SOF)

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
0001 C-130J Tactical Airlift Modernization	0	9910	0	0	0	9910
0002 C-130H Tactical Airlift Modernization	0	0	1991	2003	TBD	TBD
Total	0	9910	1991	2003	TBD	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program establishes an affordable, cost effective and reliable theater airlift solution that can preserve the existing C-130E/H capability at reduced costs. The aircraft will modernize the current fleet of aircraft assigned to the active component.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) 0001, C-130J Tactical Airlift Modernization: This project begins a study effort (predevelopment phase) for potential procurement of aircraft to meet the requirement specified in the Enhanced Theater Airlifter (ETA) SON. The predevelopment effort will provide a better definition of system performance, required asset availability (RAA), cost, schedule, productivity, supportability, testing and industrial base responsiveness.

(U) FY 1990 Accomplishments:
- (U) None

(U) FY 1991 Planned Program:
- (U) Perform trade studies.
- (U) Crew Station Workload Analysis.
- (U) Perform a Training Systems Analysis.
- (U) Perform a Cost and Operational Effectiveness Analysis.
- (U) Perform Risk Reduction Studies.
- (U) Define requirements and conduct requirement reviews.

(U) This is a one year project and additional planning is not applicable. Project is complete after the 1991 effort.

(U) Work Performed By: IN HOUSE - Special Operations Forces System Program Office; DCS/Integrated Engineering/Technical Management; Deputy for Development Planning; Training Systems System Program Office, Wright Patterson AFB, OH. CONTRACTORS - Lockheed Aeronautical Systems Company, Marietta, GA. Others are to be determined.

Program Element: #0404011F Budget Activity: #4 - Tactical Programs

PE Title: Special Operations Forces (SOF)

(U) Related Activities:
- (U) None

(U) Other Appropriation Funds:
- (U) None

(U) International Cooperative Agreements:
- (U) None

2. (U) 0002, C-130H Tactical Airlift Modernization: This project supports modernization of the active duty C-130 airlift fleet with the acquisition of new C-130H aircraft, beginning in FY 1992.

(U) FY 1990 Accomplishments:
- (U) None

(U) FY 1991 Planned Program:
- (U) Prepare necessary documentation to support an executable acquisition program, starting in FY 1992.

(U) FY 1992/1993 Planned Program:
- (U) Initiate Acquisition Logistics Support.
- (U) Accomplish contract schedule support.
- (U) Provide Mission support for acquisition.

(U) Work Performed By: IN HOUSE - Special Operations Forces System Program Office; DCS/Integrated Engineering/Technical Management; Deputy for Development Planning; Training Systems System Program Office, Wright Patterson AFB, OH. CONTRACTORS - Lockheed Aeronautical Systems Company, Marietta, GA. Others are to be determined.

(U) Related Activities:
- (U) None

(U) Other Appropriation Funds:
- (U) Aircraft Procurement (BA 102 Airlift Aircraft)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
C-130(#14)	0	0	365.9	382.3	TBD	TBD
Quantity	0	0	8	12	TBD	TBD

(U) International Cooperative Agreements:
- (U) None

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601101F Budget Activity: #1 - Technology Base
PE Title: In-House Laboratory Independent Research

A. (U) RESOURCES ($ In Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
In-House Laboratory Independent Research	7,498	7,247	9,972	10,281	Cont	TBD
Total	7,498	7,247	9,972	10,281	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program provides discretionary funds for Air Force Laboratory Directors to use in pursuing promising, high risk, high payoff research opportunities which arise during the fiscal year. This program permits Air Force laboratories to maintain an aggressive research program vital to their role as leaders in national research. The Air Force manages this program with the intent that it be unencumbered by programmatic justification and budgetary documentation prior to beginning work, relying instead on the discretion of the Laboratory Directors who annually report their achievements and the status of their projects of the past year to an Air Force evaluation panel chaired by the AFSC Chief Scientist. Distribution of funds is based on these after-the-fact reviews. The FY 1992 increase reflects Air Force emphasis on technological excellence and the conviction that a robust in-house research program is vital to that objective.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1990 Accomplishments:

- (U) Designed, fabricated, and tested optical cells used in laser diagnostics to measure the thermal decomposition of jet fuel on surfaces, which leads to fouling of jet engine components.
- (U) Demonstrated the use of thermotropic liquid crystalline polymers (polybenzimidazoles) in light-weight rocket motor parts such as motor cases and nozzles.
- (U) Measured atmospheric turbulence at a 3 kilometer vertical range with a range resolution of 100-200 meters using a bistatic lidar system. Remote detection of atmospheric turbulence is of crucial importance to both Air Force and commercial flight operations, particularly take-offs and landings.
- (U) Discovered the formation of a magnesium sulfide film on aluminum samples exposed to low earth orbit conditions aboard the Long Duration Exposure Facility (LDEF) launched and later recovered by the Space Shuttle. This contamination of the aluminum surface could have important implications for responses of optical sensors.

Program Element: 0601101F Budget Activity: #1 - Technology Base
PE Title: In-House Laboratory Independent Research

(U) FY 1991 Planned Program:
- (U) Since the purpose of this Program Element is to provide discretionary funds, work units do not require prior approval. Results of the FY 1990 program were reviewed by the Air Force panel during Aug 1990.
- (U) Distribution of the FY 1991 budget was made after the Aug 1990 review.
- (U) A portion of the work begun in FY 1990 will continue into FY 1991.
- (U) New efforts will be selected by the Laboratory Directors.

(U) FY 1992 Planned Program:
- (U) The same management approach will be used as that used in FY 1991.

(U) FY 1993 Planned Program:
- (U) The same management approach will be used as that used in FY 1991.

(U) Worked Performed By: This is totally a laboratory directed research program In which all Air Force Laboratories participate, performing the work in-house and awarding contracts only on an exceptional basis. During FY 90, significant contributions were made by Wright State University, Dayton, OH; and the University of Pittsburgh, Pittsburgh, PA.

(U) Related Activities:
- (U) PE 0601101A, In-House Laboratory Independent Research.
- (U) PE 0601152N, In-House Laboratory Independent Research.
- (U) Program results transition to a variety of laboratory development activities for continued funding.
- (U) Oversight responsibility resides in the Office of the Deputy Director, Defense Research & Engineering.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

A. (U) RESOURCES ($ in thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2301 Physics	21,604	18,771	21,384	22,370	Cont	TBD
2302 Structures	10,362	10,109	10,782	11,280	Cont	TBD
2303 Chemistry	24,786	23,956	25,884	27,078	Cont	TBD
2304 Mathematics	22,069	22,070	23,741	24,836	Cont	TBD
2305 Electronics	20,725	20,431	22,881	23,937	Cont	TBD
2306 Materials	23,155	21,862	24,656	25,793	Cont	TBD
2307 Fluid Mechanics	14,865	15,685	16,941	17,722	Cont	TBD
2308 Energy Conversion	8,863	10,604	10,984	13,490	Cont	TBD
2309 Terrestrial Sciences	4,679	12,464	2,554	2,671	Cont	TBD
2310 Atmospheric Sciences	9,335	11,051	12,154	12,715	Cont	TBD
2311 Astronomy & Astrophysics	5,853	6,975	7,951	8,318	Cont	TBD
2312 Biological & Medical Sciences	9,830	11,471	11,630	12,167	Cont	TBD
2313 Human Resources	9,980	10,711	11,664	12,201	Cont	TBD
Total	186,106	196,160	203,206	214,578	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology Base program element, managed by the Air Force Office of Scientific Research, supports Air Force research efforts comprised of in-house investigations in Air Force Laboratories and extramural activities in academia and industry. The program element funds broad-based scientific and engineering basic research in technologies critical to the Air Force mission and in the search for future critical technologies. These technologies include aerospace structures, aerodynamics, materials, propulsion, power, electronics, computer science, directed energy, conventional weapons, life sciences, terrestrial, atmospheric, and space sciences. Areas receiving special emphasis include: algorithms and software for high performance computing; novel optical materials for transmission and processing of information carried by lightwaves; ultra high speed electronics; advanced fighter aircraft engine materials; biotechnology for advanced aerospace materials; flight mechanics; characterization of composite materials; high energy density propellants and fuels; human performance, neurophysiology, and man-machine interface; high quality x-ray sources; optical and x-ray lithography; solar activity

prediction for space weather; and environmental clean up technology. This technology base is broadened through a number of programs including a summer faculty and graduate student program wherein university researchers spend ten weeks during the summer working at an Air Force laboratory; a resident research associateship and university resident research program wherein researchers can spend up to one year at an Air Force laboratory; and several graduate assistantships and laboratory graduate fellowship programs in technology areas of critical interest to the Air Force.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 2301, 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, communications, 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 Physics and Pulsed Prime Power Generation.

(U) FY 1990 Accomplishments:
- (U) Development of a compact, lightweight device that modulates powerful electron beams for use in creating high energy pulses and charged particle beam acceleration.
- (U) Produced the first extensive, accurate measurements of interactions between electrons and xenon atoms that can pump the atomic xenon laser.
- (U) Demonstration of a radically new electronic device principle, the nonlinear transmission line (NLTL), major applications in testing and high frequency generation.

(U) FY 1991 Planned Program:
- (U) Studies on the generation of bright x-rays through the interaction of electron beams with materials.
- (U) Plasma physics program to emphasize concepts such as collective particle acceleration; continue promising studies on very high power microwave/millimeter-wave devices using advanced beam-plasma interaction concepts and numerical modeling tools.
- (U) Emphasis on using NLTLs as a means of efficiently converting microwaves into high frequency millimeter waves.
- (U) Demonstrate optical devices for producing optical radiation, and converting/controlling its wavelength on the same chip.

(U) FY 1992 Planned Program:
- (U) Study concepts for independent control of surface emitting laser arrays for optical computing.
- (U) Studies will be emphasized on collisions of ultracold trapped neutral atoms and quantum threshold behavior of cross sections and scattering in external fields, a new regime of physics.
- (U) Research on a computer-based plasma physics expert system to facilitate the modeling of complex plasma systems; studies of x-ray generation by electron beam/matter interactions.

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

(U) FY 1993 Planned Program:
- (U) Research in wafer scale union pioneering the idea that millimeter-wave integrated circuits can be optically interconnected for signal/phase distribution, and control functions.
- (U) Study of electro-optic generation of high power electromagnetic pulses for impulse radars.
- (U) Advanced research in x-ray imaging and x-ray holography, with applications to next generation integrated circuit fabrication.

(U) Work Performed By: The following Air Force Laboratories are conducting research under this project: Wright Laboratories, Wright-Patterson AFB OH; Phillips Laboratory, Kirtland AFB NM; and the Frank J. Seiler Research Laboratory, USAF Academy CO. The top five universities or contractors for this project are: Stanford University, Stanford CA; University of New Mexico, Albuquerque NM; University of Arizona, Tucson AZ; University of Maryland, College Park MD; and University of Southern California, Los Angeles CA.

(U) Related Activities:
- (U) Program Element #0602203F, Aerospace Propulsion.
- (U) Program Element #0602601F, Advanced Weapons.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2302, Structures: Research in structures includes dynamics and stability, damage mechanisms, and response of structures and materials. This work provides the basic understanding and methodology necessary for design and operation of superior aerospace weapon systems and installations. This research directly supports the National Aerospace Plane (NASP) and the Advanced Tactical Fighter (ATF).

(U) FY 1990 Accomplishments:
- (U) Developed a new optimal-tracking control law for rapid maneuver and control of large flexible vehicles and structures.
- (U) Accurate predictions of damage and failure of laminated composite materials for aerospace vehicle applications.

(U) FY 1991 Planned Program:
- (U) An enhancement of wave propagation in granular and fractured materials based upon microstructural changes for application to hardened underground structures.
- (U) Modeling of damage response mechanisms, micromechanical deformation and constitutive properties of aerospace materials, structure-fluids-controls interaction, unsteady flow and structural coupling in flight structures.

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

(U) FY 1992 Planned Program:
- (U) Research on high temperature behavior of structural ceramics to accurately predict the response in jet engines, hypersonic vehicles, stealth technology and space applications.
- (U) Research on the fundamental relationship between material imperfections and performance-degrading structural imperfections.
- (U) Research in biomimetics, the advancement of superior man-made aerospace structural materials by understanding and imitating the structure and function of naturally evolved materials.

(U) FY 1993 Planned Program:
- (U) Study the penetration of soil, rock, and concrete for more accurate weapons delivery systems against hardened structures.
- (U) Research adaptive structures for multiple use and sustained performance in rapidly changing environments or when damaged.

(U) Work Performed By: The following AF Laboratories are conducting research under this project: Wright Laboratories, Wright-Patterson AFB OH; Phillips Laboratory, Kirtland AFB NM; the Air Force Engineering and Services Center, Tyndall AFB FL, and the Frank J. Seiler Research Laboratory, USAF Academy CO. The top five universities or contractors for this project are: Northwestern University, Evanston IL; University of California, CA, Purdue University, West Lafayette IL, Virginia Polytechnic University, Blacksburg VA, University of Illinois, Urbana IL.

(U) Related Activities:
- (U) Program Element #0602102F, Materials.
- (U) Program Element #0602201F, Aerospace Flight Dynamics.
- (U) Program Element #0602206F, Civil Engineering and Environmental Quality.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2303, Chemistry: Advances are sought in Air Force technological capabilities in structural and electronic materials, geo-environmental characterization, electromagnetic and conventional weaponry, electrochemical power systems, and new propellants. Specific research emphasizes synthesis and characterization of higher performance and lower cost nonmetallic materials for application as structural composites, lubricants, and sealants. A detailed description is sought of atomic-level surface interactions that can limit performance of electronic devices and tribological materials. Also under investigation is the reaction chemistry of the upper atmosphere that controls the density of the ionosphere as well as the intensity and spectral distribution on infrared background radiation. Separate but similar investigations of molecular energy release mechanisms and energy storage in

metastable molecular systems foster advances in laser weapons development and new chemical propellants.

(U) FY 1990 Accomplishments:
- (U) Synthesis of polymers with optical properties comparable to gallium arsenide/gallium aluminum arsenide for use in optical computing, optical signal processing, and laser protection.
- (U) Atomic-oxygen resistant ceramic coatings for spacecraft have been developed that withstand the "sandblasting" effect of oxygen atoms encountered during low-Earth orbit.
- (U) Development of a modified process for a low-cost rigid rod polymer affording novel thermomechanical and electro-optical properties for ballistic-protective fabrics, high-strength ultralightweight structural composites, laser protection, signal processing, and optically based computers.

(U) FY 1991 Planned Program:
- (U) Research effort in obtaining a fundamental understanding of tribological processes of importance to solid lubrication in future high performance turbine engines.
- (U) Research on processing ceramics from organometallic precursors by pyrolysis will continue to shift toward materials containing zirconium, hafnium, titanium, and tantalum.
- (U) Research on plasma chemistry in the upper atmosphere will include ion-molecule reactions that have a large impact on the electron density in the ionosphere, affecting communications.
- (U) The high energy density materials program will emphasize an understanding of how to make useful energetic condensed phase materials from high energy molecules for use in longer lifecycle electrochemical space power systems.

(U) FY 1992 Planned Program:
- (U) Polymer research will emphasize new multifunctional micro-molecules that combine high mechanical strength with intrinsic electro-optical properties, with applications in aircraft structures/skins for detection of hostile aircraft/missiles.
- (U) New research in ceramics processing will help pinpoint the basis for nanostructural design, to permit the fabrication of materials with the highest achievable toughness and strength.
- (U) Research initiative aimed at understanding carbon oxidation and its inhibition will allow improvements in the useful temperature range of high-strength carbon-carbon composites.

(U) FY 1993 Planned Program:
- (U) A new program will seek to control the molecular architecture of optically active polymers in the form of neural networks; systems applications in parallel optical signal processing.
- (U) Development of methods to reveal the details of chemical reactions as they occur molecule by molecule in real time on the scale of single vibrations of molecular segments. Systems selected for emphasis include controlled vapor phase deposition of microelectronic thin films.

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- (U) The phenomenon of spontaneous ionization of gases surrounding satellites at critical orbital velocities will be evaluated in laboratory simulation to reduce the surveillance signature.

(U) Work Performed By: The following AF organizations are conducting research under this project: Wright Laboratories, Wright-Patterson AFB OH; Phillips Laboratory, Kirtland AFB NM; the AF Engineering Services Center, Tyndall AFB FL; and the Frank J. Seiler Research Laboratory, USAF Academy CO. The top five universities or contractors for this project are: California Institute of Technology, Pasadena CA; Cornell University, Ithaca NY; Massachusetts Institute of Technology, Cambridge Mass; SRI International, Menlo Park CA; and University of California, Los Angeles CA.

(U) Related Activities:
- (U) Program Element #0602102F, Materials.
- (U) Program Element #0602302F, Rocket Propulsion.
- (U) Program Element #0602601F, Advanced Weapons.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 2304, Mathematics: Mathematical and computer sciences research focuses on the discovery of mathematical and computational methods to provide for mathematical modeling, simulation, and control of complex systems and to provide analytical and computational methods to solve problems of critical importance to the Air Force. Topics include control of aerospace systems; models and computational tools for the 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 independent weapons; reliability and maintainability; and the allocation of resources in logistics or operational activities using ideas from optimization and linear programming theories.

(U) FY 1990 Accomplishments:
- (U) Ability to predict the range of interface deflections of laser light and two nonlinear dielectric media, having applications in fabricating a device for optical message splitting.
- (U) Successful development of a new mathematical methodology for determining physically based damping mechanisms in continuum models for flexible composite structures, which can be used for adaptive control systems in high-performance vehicles.
- (U) Development of algorithms and computer codes that generate optimal solutions 3 to 20 times faster than current software.

(U) FY 1991 Planned Program:

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- (U) Special attention on developing the theory and foundations of wavelets into a versatile and effective tool for solving problems in signal and image processing.
- (U) A new initiative in combinatorial optimization is planned to develop new mathematical concepts and algorithms for the solution of optimization problems involving integer variables.

(U) FY 1992 Planned Program:

- (U) An initiative in the mathematics of hypersonics will begin, with emphasis placed on theoretical and associated numerical descriptions of nonlinear instabilities and transitions that accompany flight of hypersonic vehicles.
- (U) Mathematical and computer science research issues in the area of electronic prototyping will be studied, including computational geometry issues that relate to automated manufacturing and to electronic design.

(U) FY 1993 Planned Program:

- (U) Increased emphasis will be directed at algorithms and software to promote effective utilization of parallel computing.

(U) Work Performed By: The following AF organizations are conducting research under this project: Rome Laboratory, Griffiss AFB NY; Wright Laboratories, Wright-Patterson AFB OH; and Phillips Laboratory, Kirtland AFB NM. The top five universities or contractors for this project are: Massachusetts Institute of Technology, Cambridge Mass; University of Illinois, Urbana IL; University of Maryland, College Park MD; University of North Carolina, Chapel Hill NC; and University of Wisconsin, Madison WI.

(U) Related Activities:

- (U) Program Element #0602201F, Aerospace Flight Dynamics.
- (U) Program Element #0602702F, Command Control Communication.
- (U) Program Element #0603728F, Advanced Computer Technology.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 2305, Electronics: Research is conducted on a range of topics that include device and component research, systems performance, and the transmission and propagation of information. Research will be pursued on semiconductor devices for high speed digital and analog signal processing, microwave and millimeter wave signal and power generation, microwave tubes, superconducting analog signal processing, optical signal processing for target recognition and terminal guidance, nuclear radiation hardening of circuits and devices, electromagnetic propagation, antennas, target signatures, and robust communications techniques for command and

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control. The overall program is responsive to stated Air Force goals in brilliant weapons, special operations, tactical reconnaissance and intelligence, electronic combat, tactical warfare, surveillance, guidance and control.

(U) FY 1990 Accomplishments:
- (U) Significant increase in the output power of a high frequency (millimeter wave) oscillator was obtained by using novel semiconductor materials and an experimental device structure.
- (U) Novel device structure for optical modulation has been found with characteristics suited for the implementation of optical neural network computers.

(U) FY 1991 Planned Program:
- (U) Highly efficient optical and millimeter wave circuits will be demonstrated; the limitations and applications of ultra-small devices will be determined for frequency-selective applications; novel high temperature superconductive electronics will be investigated.
- (U) Research on volume optical memories to find fast access storage of massive amounts of data. Self learning, adaptive optical neural computers for real time applications will be investigated, and ultrafast detection of optical and electronic signals using a newly discovered semiconductor crystal phase.

(U) FY 1992 Planned Program:
- (U) New initiative will begin on the newly discovered silicon-germanium alloys, with emphasis on advanced devices.
- (U) Ultra-high frequency applications of high-temperature superconductive electronics will be sought. Adaptive, self-learning neural networks will be implemented optically for increased speed. Secure propagation through ionospheric ducts and novel space-borne long wavelength antennas based on particle beams will be studied.

(U) FY 1993 Planned Program:
- (U) More complex and faster signal processing will be sought via millimeter and optical systems.
- (U) The relative advantages of superconductive, electronic, and optical devices will be studied.

(U) Work Performed By: The following AF organizations are conducting research under this project: Rome Laboratory, Griffiss AFB NY; Wright Laboratories, Wright-Patterson AFB OH; and Phillips Laboratory, Kirtland AFB NM. The top five universities or contractors for this project are: University of California, Santa Barbara CA; University of California, Berkeley CA; University of Southern California, Los Angeles CA; University of Texas, Austin TX; and Cornell University, Ithaca NY.

(U) Related Activities:
- (U) Program Element #0602204F, Aerospace Avionics.

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- (U) Program Element #0602702F, Command Control Communications.
- (U) Program Element #0603728F, Advanced Computer Technology.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 2306, Materials: The materials research program provides the knowledge required for improving the performance, cost, and reliability of structural and electronic materials. The structural materials research program covers a broad range of material properties, such as strength, toughness, fatigue resistance, and corrosion resistance of airframe, turbine engine, and spacecraft materials. Emphasis is on titanium, aluminum, magnesium, niobium and nickel-based alloys, metal and ceramic matrix composites, and ceramics. Research in new processing methods and nondestructive evaluation of these materials complements research on materials properties. The electronic materials research program is concerned with semiconductor, optical, superconducting and magnetic materials used in avionics, surveillance, communications, guidance, and electronic warfare. Emphasis is on compound semiconductors, superconductors, materials for infrared fiber optic systems and nonlinear optical materials for signal processors.

(U) FY 1990 Accomplishments:
- (U) Developed a fundamental understanding of toughening mechanisms in a number of new, high-temperature, low-density intermetallic alloys being developed for gas turbine engines.
- (U) Nondestructive viewing of the surface atomic structure of carbon fibers has been accomplished using scanning tunneling microscopy, allowing for improved characterization of the fiber-matrix interface in developing composite materials.
- (U) Development of creep-resistant fine-grained monolithic ceramics that exhibit no change in microstructure or strength after prolonged high-temperature exposure.

(U) FY 1991 Planned Program:
- (U) Investigations will be initiated on the understanding and control of interface phenomena in novel structural materials in order to improve mechanical properties and enhance reliability, along with new efforts on toughening mechanisms for ceramics.
- (U) Research on very high temperature structural materials for skins of high Mach number aircraft and for advanced propulsion systems, and on material issues that impact on electromagnetic device behavior will be emphasized.

(U) FY 1992 Planned Program:
- (U) Emphasis on processing with special attention given to new complex high temperature materials. Surface and interface studies will be conducted in carbon-carbon materials to improve

their environmental resistance. Fracture mechanics at very high temperatures will be pursued.

- (U) Development of an understanding of the effects of microstructure on macroscopic properties of advanced structural materials, with emphasis given to alloy theory and fundamental rationale of alloy development of several new classes of materials: metal and ceramic matrix composites, niobium alloys, magnesium alloys and intermetallics.
- (U) Research with strong emphasis on the understanding of atomic level order/disorder transitions, advancing our capability to store information on an atomic level and assist in the understanding of the kinetics of crack growth initiation.

(U) FY 1993 Planned Program:

- (U) Research will address the relationships between the compositional and microstructural features of metals and ceramics and their physical/chemical/mechanical properties.
- (U) Specific research will be pursued on high temperature structural materials for propulsion applications, lightweight materials for aircraft/spacecraft, with mechanical properties, processability, reliability, maintainability being emphasized.

(U) Work Performed By: The following AF Laboratories are conducting research under this project: Wright Laboratories, Wright-Patterson AFB OH; Rome Laboratory, Griffiss AFB NY; and Phillips Laboratory, Kirtland AFB NM. The top five universities or contractors for this project are: Massachusetts Institute of Technology, Cambridge Mass; University of Illinois, Urbana IL; Rockwell International, Thousand Oaks CA; Stanford University, Stanford CA; and Westinghouse Electric Corporation, Pittsburgh PA.

(U) Related Activities:

- (U) Program Element #0602102F, Materials.
- (U) Program Element #0603211F, Aerospace Structures/Materials.
- (U) Program Element #0708011F, Manufacturing Technology.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

7. (U) Project 2307, Fluid Mechanics: Air Force basic research in fluid mechanics provides knowledge and methodologies for improving the efficiency and effectiveness of aerospace vehicles. The research seeks to provide understanding of key fluid flow phenomena, to improve theoretical models for aerodynamic prediction and design, and to originate flow control concepts and predictive methods to expand current flight performance boundaries. Research issues include the development of computational methods to predict complex flows, prediction of real gas effects in hypersonic flight, turbulence prediction and control in shear flows affecting vehicle

aerodynamics, the dynamics of unsteady and separated flows associated with enhanced flight vehicle maneuverability, and heat transfer and flow instabilities in gas turbine engines.

(U) FY 1990 Accomplishments:
- (U) Development of a new flow-control technique that employs unsteady base bleed to prevent undesirable forebody vortices; active vortex control can extend the maneuverability of high performance aircraft and weapons systems.

(U) FY 1991 Planned Program:
- (U) Studies of convective heat transfer to improve predictive techniques for gas turbine engines; development of active control concepts for more stable operation of gas turbine engines and for enhanced cooling of turbine blades.
- (U) Research in computational aerodynamics will focus on the development of auto-adaptive and 3-D unstructured grid techniques for flows around complex shapes such as integrated engine-airframe configurations.
- (U) Feedback techniques for controlled turbulent mixing and drag reduction will continue to be explored; vortex control for enhanced maneuverability in the post-stall flight regime; research on transition mechanisms in high altitude hypersonic boundary layer flows with real gas kinetics.

(U) FY 1992 Planned Program:
- (U) Development of turbulence models which include the effects of compressibility for application to the computation of the complex high speed aerodynamics of advanced aerospace vehicles.
- (U) Work on flow control to provide the conceptual basis for future turbulence control applications such as reduced aerodynamic drag and enhanced mixing in combustors.
- (U) Research in hypersonic aerothermodynamics with emphasis on real gas effects and the prediction of near-continuum and rarefied gas flows; nonlinear flight mechanics and unsteady separated flows to enhance flight vehicle maneuverability; concepts for the control of rotating stall and surge in engine compressors.

(U) FY 1993 Planned Program:
- (U) Computational fluid dynamics emphasis on the possibility of exploiting increased parallelism in emerging computer architectures for full vehicle flow simulation.
- (U) Research in unsteady aerodynamics will emphasize control of longitudinal vortex structures and the development of computational methods for prediction of airflows around supermaneuverable aircraft.

(U) Work Performed By: The following AF Laboratories are conducting research under this project: Wright Laboratories, Wright-Patterson AFB OH; Phillips Laboratory, Kirtland AFB NM; and the Frank J. Seiler Research Laboratory, USAF Academy CO. The top five universities or contractors for this project are: Massachusetts

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Institute of Technology, Cambridge MA; Princeton University, Princeton NJ; Stanford University, Stanford CA; University of Southern California (USC), Los Angeles CA; and University of Washington, Seattle WA.

(U) Related Activities:
- (U) Program Element #0602102F, Materials.
- (U) Program Element #0602201F, Aerospace Flight Dynamics.
- (U) Program Element #0602203F, Aerospace Propulsion.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

8. (U) Project 2308, Energy Conversion: This project involves the efficient utilization of energy in Air Force propulsion and weapon systems, including airbreathing engines and chemical and non-chemical rockets. Research is organized into the areas of chemically reacting flow, non-chemical energetics, and diagnostics. Chemically reacting flows involve complex coupling between energy release through chemical reaction and the flow processes which transport chemical reactants, products and heat. Non-chemical energetic systems include plasma and beamed energy propulsion for orbit raising space missions and efficient ultra-high energy thermionic systems for space-based energy utilization. Thermal management of spaced-based power and propulsion systems will be addressed. The research in diagnostics supports the first two areas by providing critically needed measurement capability for processes such as spray and solid propellant combustion and plasma propulsion.

(U) FY 1990 Accomplishments:
- (U) Evidence linking gas-phase fluorescence with the presence of soot particles which result from hydrocarbon fuels which can degrade gas turbine engine durability.
- (U) Discovery of recirculating flow patterns within liquid fuel droplets using the quenching of laser-induced fluorescence.

(U) FY 1991 Planned Program:
- (U) Studies of droplet and spray behavior to include the coupling between sprays and instabilities in liquid-fuelled rockets and the turbulent dispersion of nondilute sprays.
- (U) Quantitative imaging will be extended to time-resolved 3-D measurements and the characterization of plasmas.

(U) FY 1992 Planned Program:
- (U) Plasma propulsion and diagnostic activity will include nonequilibrium dynamics and instabilities relevant to plasma thruster performance; the analysis of flowfield and dissipation in arcjets to improve thruster efficiency; the prediction of

ionized cluster beam formation to increase ion engine thrust.
- (U) Activity in diagnostics will involve the study of four-wave mixing laser-induced fluorescence.

(U) FY 1993 Planned Program:
- (U) Atomic and molecular clusters will be studied in the solid, liquid, and gaseous states for next generation plasma and nuclear propulsion systems.
- (U) Studies will be initiated on the thermal stability and heat absorption characteristics of fuels for future hypersonic aircraft and aerospace vehicles.
- (U) A new program in ballistic missile technology will begin.

(U) Work Performed By: The following AF Laboratories are conducting research under this project: Phillips Laboratory, Kirtland AFB NM; and Wright Laboratory, Wright-Patterson AFB OH. The top five universities or contractors for this project are: California Institute of Technology, Pasadena CA; Massachusetts Institute of Technology, Cambridge MA; Pennsylvania State University (Penn State), University Park PA; Princeton University, Princeton NJ; Yale University, New Haven CT.

(U) Related Activities:
- (U) Program Element #0602102F, Materials.
- (U) Program Element #0602203F, Aerospace Propulsion.
- (U) Program Element #0602302F, Civil Engineering Technology.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

9. (U) Project 2309, Terrestrial Sciences: This project provides basic research in geodesy, gravity, and seismology to understand the problems associated with increasing missile accuracy and underground nuclear testing. Research in geodesy is required to determine the exact position of targets with respect to missile launch sites. Research in gravity allows determination of its effect on missile guidance systems along flight paths. Seismology research improves capability to detect, locate, identify, and estimate the yield of underground nuclear tests. It also improves knowledge required to predict the effects of ground motion generated from earthquakes/nuclear explosions.

(U) FY 1990 Accomplishments:
- (U) Greatly improved understanding of seismic wave propagation in the western United States to verify test-ban treaty adherence.
- (U) Identified and characterized phases in seismic waves that allow more accurate source location of nuclear tests.
- (U) Assembled a superfluid helium interface gyroscope having

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unprecedented sensitivity and response time.

(U) FY 1991 Planned Program:
- (U) Investigate the feasibility to perform space navigation, attitude control, and gravity estimation using data from Global Positioning System (GPS) receivers on board low-orbiting satellites; study integration of GPS with inertial navigation systems for gravity estimation and semiautonomous navigation.
- (U) Interpret seismic data recorded in the Soviet Union.
- (U) Initiate research to improve knowledge of the seismic source parameters of rockbursts from deep mines, and expand portable seismic data acquisition systems to improve knowledge of geological site variability.
- (U) Continue experimental research on superfluid helium interference gyroscope.

(U) FY 1992 Planned Program:
- (U) Improve high-altitude gravity estimation, satellite navigation, attitude control, and tracking using GPS.
- (U) Pursue seismic research and data analysis in key geographic areas to improve nuclear test discrimination capability.
- (U) Research in experimental and theoretical rock deformation will be continued to improve knowledge of the effects of near source rock properties on the propagation of seismic energy.

(U) FY 1993 Planned Program:
- (U) Geodesy and gravity research will continue on techniques and instrumentation to improve the accuracy of gravity estimation for inertial guidance and navigation systems, and to develop new inertial systems for improved space and air navigation.

(U) Work Performed By: Phillips Laboratory, Kirtland AFB NM is conducting research under this project. The four universities or contractors for this project are: Southern Methodist University, Dallas TX; University of Texas at El Paso, El Paso TX; Massachusetts Institute of Technology, Cambridge MA; and University of Federal Armed Forces, Munich Germany.

(U) Related Activities:
- (U) Program Element #0602101F, Geophysics.
- (U) Program Element #0602204F, Aerospace Avionics.
- (U) Program Element #0602206F, Civil Engineering Environmental Quality
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

10. (U) Project 2310, Atmospheric Sciences: Research in the atmospheric sciences includes the physics, dynamics, and chemistry of processes that determine the structure and variability of the earth's

atmosphere. Atmospheric properties such as wind, density, clouds and precipitation, ionization, and optical and infrared characteristics all affect the performance of Air Force systems. A major effort is devoted to the development and use of new measurement techniques and the development of models for predicting weather and other atmospheric conditions. Emphasis is placed on understanding atmospheric effects on optical and infrared weapons systems and on understanding the dynamics and structure of the ionosphere which affect communication and surveillance systems.

(U) FY 1990 Accomplishments:
- (U) Development of a nonlinear model that explains the electron accelerations necessary to produce aurora; understanding this phenomena helps forecasting their behavior and minimizing their impact early warning and command/control systems.

(U) FY 1991 Planned Program:
- (U) Program in atmospheric electricity will seek to define the processes of electric charge separation in clouds and to develop techniques for remotely sensing triggered lightning.
- (U) Research in battlefield meteorology will emphasize new techniques for data assimilation modeling, and the development of knowledge-based systems; improved analytical/predictive capabilities for the upper stratosphere and the ionosphere.
- (U) Investigation into the effects of geomagnetic storms, which can adversely impact low-orbiting spacecraft and a variety of weapon, communication, and surveillance systems.

(U) FY 1992 Planned Program:
- (U) Basic research in mesoscale modeling will seek to exploit the capabilities of newly fielded observational systems, such as radar wind profilers and the Next Generation Weather Radar (NEXRAD). Primary focus will be on data assimilation and modeling of fine-scale atmospheric structure to improve battlefield and target weather forecasts.
- (U) The ionospheric program will emphasize modeling of the neutral and ionized environment to improve overall understanding of the complex and coupled processes that cause geomagnetic disturbances and irregularities in the upper atmosphere, which can impact Air Force surveillance and communications systems.

(U) FY 1993 Planned Program:
- (U) A major thrust will be on the national storm program which is scheduled to have its full complement of profilers and radars which will provide researchers with unprecedented information about the detailed structure and interaction of the mesoscale environment, with concentration on cloud and precipitation.
- (U) Theoretical gravity wave research should provide an additional basis for more accurate weather prediction models.
- (U) Ionospheric modeling capabilities will continue to expand with the new data scheduled to be available from observation systems including the upper atmosphere research satellite (UARS).

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(U) Work Performed By: Phillips Laboratory, Kirtland AFB NM is conducting research under this project. The top five universities or contractors for this project are: Massachusetts Institute of Technology, Cambridge MA; Colorado State University, Fort Collins CO; Utah State University, Logan UT; Penn State, University Park PA; SRI International, Menlo Park CA.

(U) Related Activities:
- (U) Program Element #0602101F, Geophysics.
- (U) Program Element #0305160F, Defense Meteorological Satellite.
- (U) Program Element #0603220C, Surveillance Acquisition, Tracking and Kill (SDI).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

11. (U) Project 2311, Astronomy and Astrophysics: This project provides basic knowledge of the space environment for the design and calibration of advanced Air Force systems. It also supports the Air Weather Service by improving observation and forecasting techniques that support operational military systems. Space environmental conditions produced by radiation and charged 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. Experimental and theoretical means are used to study methods to improve space surveillance systems and to study solar outbursts and their travel to the earth where they affect communications and satellite systems. Also being studied is composition of the space environment, changes caused by natural and man-made disturbances, and the response of spacecraft systems and operations to the space environment.

(U) FY 1990 Accomplishments:
- (U) Identified extremely high energy solar protons which can penetrate spacecraft components and cause serious degradation.
- (U) Obtained new high resolution observations of solar flares which can contribute to the development of accurate forecasts of space hazards from solar storms.

(U) FY 1991 Planned Program:
- (U) Research relating solar activity to geomagnetic disturbances by remote sensing, and in-situ measurements of interplanetary disturbances, will improve predictive capabilities for the occurrence and severity of geomagnetic storms.
- (U) Wave particle interactions will be theoretically and empirically determined to define their role in the dynamics of the Earth's radiation belt; determine the feasibility of using modulated electron beams at low frequencies as survivable

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communications antennas.
- (U) A study of arbitrary background sources from the infrared astronomical satellite (IRAS) low resolution spectrometer data which is of importance to space surveillance.

(U) FY 1992 Planned Program:
- (U) The solar maximum observational and theoretical efforts will continue. Intensive modelling efforts will be undertaken aimed at meeting the DOD/Air Force needs for space weather forecasts.
- (U) New computer code capable of tracking the evolution of magnetic fields in all stages of solar eruptions will be tested.
- (U) Results from rocket electron beam tests will be analyzed to determine how waves generated by electron beams propagate from space to ground receivers.

(U) FY 1993 Planned Program:
- (U) Time dependent solar activity models of flare and mass ejection processes will be tested to improve prediction of solar emissions that have catastrophic effects on space systems.
- (U) Determine the feasibility of using solar filaments to forecast the direction/strength of the interplanetary magnetic field.
- (U) Work will be carried out to establish the coupling between the solar wind and the magnetosphere needed to establish global models for advanced space weather specifications.
- (U) Participation with NASA and Canadian scientists on a shuttle experiment to investigate waves in space plasmas, allowing evaluation of models for gyroresonant electron acceleration.

(U) Work Performed By: Phillips Laboratory, Kirtland AFB NM is conducting research under this project. The top five universities or contractors for this project are: National Science Foundation, Washington DC; Boston College, Chestnut Hill MA; University of Wyoming, Laramie WY; Columbia University, New York NY; and California Institute of Technology, Pasadena CA.

(U) Related Activities:
- (U) Program Element #0602101F, Geophysics.
- (U) Program Element #0602702F, Command Control Communication.
- (U) Program Element #0603410F, Space Systems Environment .
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

12. (U) Project 2312, Biological and Medical Sciences: This research project provides knowledge needed to protect Air Force personnel and enable them to perform effectively in hostile environments. The project consists of three major research programs: (1) biological effects of radiofrequency radiation and toxic chemicals are being studied to assess hazards to personnel and the

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environment and to devise protective measures; (2) research in mechanisms of neuroregulation is being conducted to understand the biological bases of human performance and thus provide ways to enhance performance by, for example, reducing the effects of fatigue, jet-lag and dirunal rhythms; and (3) research to develop computer architectures modeled after neuronal systems is aimed at providing powerful new approaches to machine intelligence.

(U) FY 1990 Accomplishments:
- (U) Research in neuroscience suggests the possibility of preventing some of the sensory overload to the visual and auditory systems during demanding Air Force operations by taking advantage of the more rapid response time provided by using tactile cues.
- (U) Demonstrated the potential usefulness of diets, enhanced with the amino acid tyrosine, in alleviating some of the deleterious effects of stress in humans imposed by physiologically and psychologically demanding Air Force missions.
- (U) Development of an elegant biochemical assay for monitoring the effects of toxic chemicals on exposed organisms, which involves the analysis of specific types of stress proteins released by body tissues in response to a toxic insult.

(U) FY 1991 Planned Program:
- (U) A new research program will begin to determine the basic mechanisms that regulate the biological rhythms controlling the daily peaks in human performance to counteract the effects of jet-lag/shift-work imposed by required Air Force operations.
- (U) Physiological and neurochemical studies to understand the basic mechanisms involved during episodes of loss of consciousness induced during abrupt maneuvers in high-performance aircraft .

(U) FY 1992 Planned Program:
- (U) The neuroscience program will continue to study the neural mechanisms underlying arousal, vigilance, sleep/wake cycles and fatigue and how these mechanisms shape the performance of skilled individuals performing demanding tasks such as flying military aircraft. Research will continue on neural pacemakers that regulate biological rhythms, developing new techniques to maintain human performance in around-the-clock operations.
- (U) Examination of the psychobiological mechanisms underlying the response to stress in order to develop new techniques for alleviating the harmful effects of stressful Air Force operations that result in degraded human performance.
- (U) Research on the environmental fate and effects of chemicals to examine how chemicals are transported through the environment, how they are transformed or degraded by microbes and how new techniques of biotechnology can be used to engineer new strains of microbes that biodegrade chemicals to less toxic forms.

(U) FY 1993 Planned Program:
- (U) Studies on the pharmacokinetics and mechanisms for metabolic transformation to nonharmful compounds will be emphasized.

Approaches utilizing genetic engineering of microbes will provide for the development of new microbial degradation schemes for restoration of contaminated sites and clean up of chemical spills resulting from Air Force operations.

- (U) Neurobiologists and experimental psychologists will investigate the mechanisms underlying attention, working memory, and long-term memory in order to provide new techniques for enhancing human performance during demanding Air Force operations. Research on the psychobiological mechanisms underlying the response to stress and the neural mechanisms regulating biological timing systems will continue to provide new ways of maintaining Air Force personnel performance that is degraded due to stress, jet-lag and irregular work schedules.

(U) Work Performed By: The following AF organizations are conducting research under this project: Wright Laboratory, Wright-Patterson AFB OH; and Armstrong Laboratory, Brooks AFB TX. The top five universities or contractors for this project are: Hahnemann University, Philadelphia PA; University of Illinois, Urbana IL; Massachusetts Institute of Technology, Cambridge MA; University of Wisconsin, Madison WI; and Yale University, New Haven CT.

(U) Related Activities:
- (U) Program Element #0602202F, Human Systems Technology.
- (U) Program Element #0602205F, Personnel, Training and Simulation.
- (U) Program Element #0603231F, Crew Systems and Personnel Protection.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

13. (U) Project 2313, Human Resources: This program provides the knowledge required for Air Force personnel to skillfully perform difficult military tasks and use complex equipment systems effectively. The objectives are to develop better ways to select individuals for jobs on the basis of their mental and physical skills, train them to do those jobs well, and design tasks and equipment to optimally match human capabilities and characteristics.

(U) FY 1990 Accomplishments:
- (U) Development of a new system capable of adaptive control of multi-joint arms and a new visual system capable of recognizing hand written numbers based on a theory of neural computing in biological systems.
- (U) Development of a new technique for image processing based on the functional neuroanatomy of the brain; new stereo matching algorithms are already in use to help align pairs of cameras for pin-point focusing on objects.

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(U) FY 1991 Planned Program:
- (U) The cognition program will continue to examine the nature of mental functions such as attention, working memory, long-term memory, judgement, reasoning, and problem-solving.
- (U) A new initiative on decision-making under stress will begin to determine the processes involved in making critical decisions while under time-pressure.
- (U) Research in understanding spatial orientation in humans will continue in order to develop techniques to prevent the spatial disorientation experienced by pilots of high performance aircraft who must make abrupt tactical maneuvers during high speed nap-of-the-earth missions.

(U) FY 1992 Planned Program:
- (U) Spatial orientation research on interactions between the visual, auditory and vestibular systems in order to understand the multi-sensory integration involved in synthesizing sensory inputs and making the appropriate orienting responses.
- (U) A new program in behavioral analysis will provide techniques to analyze human performance in situations in which large numbers of factors are changing rapidly, to help predict performance in rapidly changing environments and assist in the design of workstations to provide for better man-machine interaction.

(U) FY 1993 Planned Program:
- (U) Multi-sensory integration and control of responses tc orienting stimuli will provide the basis for improved understanding of spatial orientation. Computational neuroscience research efforts will continue with an emphasis on modeling the information processing capabilities of the brain.
- (U) A new research program will examine group decision making processes in an effort to understand the psychological processes involved in communication fidelity and how best to structure command and control operations to improve the decision making process of teams.

(U) Work Performed By: Armstrong Laboratory, Brooks AFB TX conducts research under this project. The top five universities or contractors for this project are: Central Institute for the Deaf, St. Louis MO; New York University, New York NY; SRI International, Menlo Park CA; Yale University, New Haven CT; and University of York, Ontario Canada.

(U) Related Activities:
- (U) Program Element #0602202F, Human Systems Technology.
- (U) Program Element #0603231F, Crew Systems and Personnel Protection.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602101F Budget Activity: #1 - Technology Base
Title: Geophysics

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
06GL Laboratory Operations	22,305	23,480	23,542	23,378	Cont	TBD
3054 Infrared Target and Background Signatures	2,156	1,897	2,482	2,715	Cont	TBD
4086 Space Subsystems Interactions	0	0	900	1,300	Cont	TBD
4087 Ballistic Missile Interactions	0	0	1,900	3,300	Cont	TBD
4643 Ionospheric Specification	2,387	2,112	2,763	3,023	Cont	TBD
6670 Atmospheric Science and Technology	1,286	1,088	1,424	1,558	Cont	TBD
7600 Terrestrial Geophysics	2,566	604	790	864	Cont	TBD
7601 Space Effects on Air Force Systems	4,182	4,259	3,609	3,949	Cont	TBD
7659 Aerospace Systems Technology	605	550	719	786	Cont	TBD
7670 Optical/Infrared Properties of the Environment	2,016	1,767	2,312	2,529	Cont	TBD
Total	37,503	35,757	40,441	43,402	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: From satellite-damaging space radiation to engine-clogging desert sandstorms, the geophysical environment often limits the warfighting capabilities of our nation's aerospace forces. This Science and Technology program develops the capability for Air Force weapon, communication, and surveillance systems to withstand the effects of the hostile natural environment within which they must operate. This work is extensively coordinated outside the Air Force with other government agencies, resulting in extensive collateral support to non-Air Force and non-DOD programs, ensuring effectiveness of joint efforts, and precluding duplication.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06GL, Laboratory Operations: This project provides for management, support, and operation of the Geophysics Directorate of AFSC's Phillips Laboratory, at Hanscom AFB MA and four locations stateside. It provides for the pay and related costs of civilian scientists, engineers, and support personnel; transportation of equipment; rents; communications and utilities costs; reproduction services; and procurement of supplies, equipment, and contractor support services for these facilities. This project supports and complements all projects in this PE. This is a continuing program.

Program Element: #0602101F **Budget Activity:** #1 - Technology Base
Title: Geophysics

(U) OTHER APPROPRIATION FUNDS ($ IN THOUSANDS):
(U) Military Construction (PE 0702806):

FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
5,600	0	8,000	0	0	13,600

2. (U) Project 3054, Infrared Target and Background Signatures: Air Force surveillance, warning, tracking, and guidance systems must be able to detect targets against natural infrared background clutter. This project characterizes infrared signatures of natural and nuclear earth and atmospheric backgrounds, and develops computer models used in system design and operation.

(U) FY 1990 Accomplishments:
- (U) Validated the F-15 and B-1B infrared signature models.

(U) FY 1991 Planned Program:
- (U) Validate the KC-10 and KC-135R infrared signature model.
- (U) Launch Spacecraft Kinetic Infrared Test (SKIRT) payload.
- (U) Conduct two more flights in the Spectral Atmospheric Variability Experiment (SAVE) program in Europe.

(U) FY 1992 Planned Program:
- (U) Transition SKIRT results to system designers.
- (U) Transition SAVE results to system designers.

(U) FY 1993 Planned Program:
- (U) Validate airborne infrared spectral signature measurements for low-observable predictions.
- (U) Combine SKIRT results with results of other programs to enhance signature evaluation of targets in low-earth orbit.

(U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of AFSC's Phillips Laboratory, Hanscom AFB MA. The contractors are Visidyne, Burlington MA; SSG, Waltham MA; Aerodyne Research, Billerica MA; Photometrics, Inc., Burlington MA; and Spectral Sciences, Inc., Bedford MA.

(U) Related Activities:
(U) Program Element 0305160F, Defense Met. Satellite Program.
(U) Program Element 0601102F, Defense Research Sciences.
(U) Program Element 0603707F, Weather Systems Advanced Dev.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

Program Element: #0602101F Budget Activity: #1 - Technology Base
Title: Geophysics

3. (U) Project 4086, Space Subsystems Interactions: This project will identify and measure the impacts of the environment on Space Based Radar (SBR) concepts including the ionosphere and space debris. Suitable environmental models for both these areas, and mitigation techniques for ionospheric effects will be developed. Results will be transitioned to Space Systems Division to support technical trade analysis and system trade studies.

(U) FY 1990 Accomplishments: New project.

(U) FY 1991 Planned Program: New project.

(U) FY 1992 Planned Program:
- (U) Measure radar clutter, amplitude, and phase scintillation effects, which can limit SBR coherent integration.
- (U) Measure variability of equatorial cross-polarization effects, which can limit SBR signal strength.
- (U) Begin development of ionospheric effects models using measurements of solar maximum effects.

(U) FY 1993 Planned Program:
- (U) Analyze ionospheric effects measurements and apply results to models of ionospheric impacts on SBR.
- (U) Start developing techniques for mitigation of ionospheric impacts on SBR.
- (U) Begin modelling of SBR-orbit space debris and assessment of the threat to SBR.

(U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of AFSC's Phillips Laboratory, Hanscom AFB MA. The contractors are TBD.

(U) Related Activities:
(U) Program Element 0603428F, Space Subsystems Technology.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

4. (U) Project 4087, Ballistic Missile Interactions: The interactions between ballistic missiles and the environment are evaluated to minimize adverse impacts. Specific efforts include the effects of plasmas on aerospace vehicles and avionics and communications systems during reentry and hypersonic flight, chemical techniques for modifying these plasmas, technology to rapidly characterize the geophysics of launch sites, advanced superconducting guidance sensors, and erosion effects on reentry vehicles under natural and disturbed target area conditions.

Program Element: #0602101F Budget Activity: #1 - Technology Base
Title: Geophysics

(U) FY 1990 Accomplishments: New project.

(U) FY 1991 Planned Program: New project.

(U) FY 1992 Planned Program:
- (U) Use mass spectrometric and optical spectroscopic techniques to analyze the plasma ion composition associated with ablation of selected heat shield materials in a plasma arc.
- (U) Identify technology requirements for rapid characterization of the geophysical parameters of launch sites for dispersed mobile launch systems.

(U) FY 1993 Planned Program:
- (U) Develop chemical plasma modification techniques to improve performance of on-board guidance sensors.
- (U) Characterize dust environment in disturbed target areas.

(U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of AFSC's Phillips Laboratory, Hanscom AFB MA. The contractors are TBD.

(U) Related Activities:
(U) Program Element 0603311F, Ballistic Missile Technology.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

5. (U) Project 4643, Ionospheric Specification: The ionosphere imposes severe constraints on the operation of Air Force communication and surveillance systems. This project develops the capability to predict, mitigate, and exploit ionospheric effects on Air Force systems.

(U) FY 1990 Accomplishments:
- (U) Completed development of techniques to chemically reduce ionospheric radio blackout with reentry vehicles.
- (U) Defined proof-of-concept experiment to demonstrate the feasibility of artificially stimulating the ionosphere.
- (U) Validated the DMSP C3 sensor using our Airborne Ionospheric Observatory and DMSP and AFSATCOM satellites.

(U) FY 1991 Planned Program:
- (U) Improve reentry calculations by demonstrating the use of ground-based lidar to obtain atmospheric density measurements up to 90km altitude.
- (U) Complete Atmospheric Density Model for the USAF Space Forecast Center.

Program Element: #0602101F Budget Activity: #1 - Technology Base
Title: Geophysics

(U) FY 1992 Planned Program:
- (U) Transition new measurements and techniques for real-time specification of C3I system outage.
- (U) Launch space experiment to obtain absolute density specifications needed for improved satellite drag models.
- (U) Assess potential to enhance the performance of C3I systems through high-power ionospheric heating.

(U) FY 1993 Planned Program:
- (U) Validate ionospheric specification models for the USAF Space Forecast Center.
- (U) Determine the effects of the equatorial ionosphere on the Advanced OTH-B system.
- (U) Complete ultraviolet radiance codes and incorporate into existing scene generation models.

(U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of AFSC's Phillips Laboratory, Hanscom AFB MA. The contractors are Northwest Research Associates, San Diego CA; University of Lowell, Lowell MA; University of Michigan, Ann Arbor MI; Emmanuel College, Boston MA; and Canadian Commercial Corp., Ottawa, Canada.

(U) Related Activities:
- (U) Program Element 0102417F, Over-the-Horizon Backscatter Radar Program.
- (U) Program Element 0305160F, Defense Met. Satellite Program.
- (U) Program Element 0601102F, Defense Research Sciences.
- (U) Program Element 0603402F, Space Test Program.
- (U) Program Element 0603707F, Weather Systems Advanced Dev.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

6. (U) Project 6670, Atmospheric Science and Technology: Military operations require reliable forecasts of mission-limiting weather conditions to be successful. This project develops descriptive and predictive models of the atmosphere from the global to the microphysical scale, and develops techniques to accurately measure atmospheric parameters worldwide.

(U) FY 1990 Accomplishments:
- (U) Developed new global cloud forecasting algorithm that is used to optimize flight routes.
- (U) Participated in joint AF/NASA field program to determine ways to predict triggered lightning for launch operations.

Program Element: #0602101F Budget Activity: #1 - Technology Base
Title: Geophysics

(U) FY 1991 Planned Program:
- (U) Quantify triggered lightning conditions for Eastern Space and Missile Center missile and Space Shuttle operations.
- (U) Establish the Advanced Meteorological Processing System facility to test new weather forecasting techniques.

(U) FY 1992 Planned Program:
- (U) Evaluate techniques for remote measurement of winds for missile launch forecasts.
- (U) Apply artificial intelligence techniques to regional-scale weather forecasting problems.

(U) FY 1993 Planned Program:
- (U) Complete DOD Cloud Information Compendium of models, data bases, and climatologies for systems design and wargaming.
- (U) Incorporate wind profiler data into weather analysis and evaluate its effects on short-range weather forecasts.

(U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of AFSC's Phillips Laboratory, Hanscom AFB MA. The top five contractors are AER, Cambridge MA; University of California, La Jolla CA; Augsburg College, Minneapolis MN; Science and Technology Corp., Hampton VA; and The Analytical Sciences Corp., Reading MA.

(U) Related Activities:
(U) Program Element 0305160F, Defense Met. Satellite Program.
(U) Program Element 0601102F, Defense Research Sciences.
(U) Program Element 0603707F, Weather Systems Advanced Dev.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

7. (U) Project 7600, Terrestrial Geophysics: New superconductors and superfluids combined with improved models of the earth's gravity field promise a revolutionary breakthrough in reaching the goal of a fully-autonomous inertial system for precise navigation, guidance, and pointing. This project develops technology in the areas of the earth's geometry, motion, gravity, and seismology for Air Force strategic and tactical systems. The large change in funding between FY 90 and FY 91 was due to a congressional addition of $1.8 million in FY 90.

(U) FY 1990 Accomplishments:
- (U) Completed testing superconducting six-axis accelerometer.

Program Element: #0602101F Budget Activity: #1 - Technology Base
Title: Geophysics

(U) FY 1991 Planned Program:
- (U) Integrate Model II Superconducting Six-Axis Accelerometer with the Model III Superconducting Gravity Gradiometer.
- (U) Design an inertial navigation system, integrated with Global Positioning System, for moving-base gravity mapping.
- (U) Field-test seismo-acoustic detection system for low-flying aircraft.

(U) FY 1992 Planned Program:
- (U) Develop techniques to discriminate between natural earth motions and nuclear blasts, allowing monitoring of lower-threshold underground tests.

(U) FY 1993 Planned Program:
- (U) Design the superconducting tensor gravity gradiometer for autonomous inertial navigation applications.
- (U) Complete knowledge-based seismic location system.

(U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of AFSC's Phillips Laboratory, Hanscom AFB MA. The contractors are the University of Maryland, College Park MD; Boston College, Chestnut Hill MA; Mayflower Communications Corp., Reading MA; and Ohio State University, Columbus OH.

(U) Related Activities:
(U) Program Element 0601102F, Defense Research Sciences.
(U) Program Element 0603402F, Space Test Program.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

8. (U) Project 7601, Space Effects on Air Force Systems: The Air Force must be able to overcome the effects of a very hazardous radiation environment on its operational space systems. This project develops technology to increase the reliability and survivability of systems operating in this hostile environment, and model environmental phenomenology and its effects on spacecraft signatures for sensor applications. The major effort is the Combined Release and Radiation Effects Satellite (CRRES), launched in FY 1990 to obtain data on the survivability of state-of-the-art electronic components projected for use on future space systems.

(U) FY 1990 Accomplishments:
- (U) Launched CRRES mission.
- (U) Obtained high-resolution X-ray image of the sun for use in solar flare predictions.

Program Element: #0602101F Budget Activity: #1 - Technology Base
Title: Geophysics

(U) FY 1991 Planned Program:
- (U) Begin development of space radiation effects models using data from CRRES.

(U) FY 1992 Planned Program:
- (U) Transition to Space Systems Division computer-aided design tools to negate contaminant effects in space systems.
- (U) Transition CRRES results on single event upsets to Space Systems Division.

(U) FY 1993 Planned Program:
- (U) Begin new solar surface studies with the adaptive solar telescope mirror to aid in predicting solar storms.
- (U) Develop model that describes propagation of solar wind through interplanetary space.

(U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of AFSC's Phillips Laboratory, Hanscom AFB MA. The Naval Research Laboratory, Washington DC, provides support. The contractors are Boston College, Chestnut Hill MA; Spectral Sciences, Burlington MA; University of California, Berkely CA; S-Cubed, La Jolla CA; and Massachusetts Technological Laboratory, Inc., West Newton MA.

(U) Related Activities:
(U) CRRES is a joint NASA/DOD program.
(U) Program Element 0102431F, Defense Support Program.
(U) Program Element 0305160F, Defense Met. Satellite Program.
(U) Program Element 0601102F, Defense Research Sciences.
(U) Program Element 0603402F, Space Test Program.
(U) Program Element 0603410F, Space Sys. Envir. Interact. Tech.
(U) Program Element 0603438F, Satellite Systems Survivability.
(U) Program Element 0603707F, Weather Systems Advanced Dev.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

9. (U) Project 7659, Aerospace Systems Technology: This project improves the usefulness of spacecraft, balloon, and sounding rocket payloads used by the Geophysics Laboratory and DOD. The work applies modern technology, particularly microelectronics, in developing experimental sensor platforms and efficient data management.

Program Element: #0602101F Budget Activity: #1 - Technology Base
Title: Geophysics

(U) FY 1990 Accomplishments:
- (U) Tested new, inexpensive balloon navigation and tracking system which uses the Global Positioning System.
- (U) Test-flew new Talos-boosted Aries sounding rocket system.
- (U) Designed and built a model for a Totally Integrated Payload Attitude Control Test (TIPACT) system.

(U) FY 1991 Planned Program:
- (U) Complete validation of Talos-boosted Aries sounding rocket system.
- (U) Study design approaches to using workstation networks for more efficient scientific data analysis.
- (U) Complete development tests of TIPACT for 1000-lb payloads.

(U) FY 1992 Planned Program:
- (U) Develop a pilot workstation network to gain real-time experience with the system.
- (U) Develop specifications for multiple-module rocket trajectories and attitude simulation, and integrate these into an interactive system.

(U) FY 1993 Planned Program:
- (U) Expand pilot workstation network to allow dynamic interaction within the laboratory and with researchers at other facilities.
- (U) Complete processing system to extract maximum data from high-rate space probe telemetry data streams.
- (U) Develop generic attitude control, recovery, and subsystems for small-payload sounding rockets.

(U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of AFSC's Phillips Laboratory, Hanscom AFB MA. The contractors are Wentworth Institute of Boston, Boston College, Chestnut Hill MA; and SIE, Lexington MA.

(U) Related Activities:
(U) Program Element 0305160F, Defense Met. Satellite Program.
(U) Program Element 0601102F, Defense Research Sciences.
(U) Program Element 0603402F, Space Test Program.
(U) Program Element 0603410F, Space Sys. Envir. Interact. Tech.
(U) Program Element 0603707F, Weather Systems Advanced Dev.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

Program Element: #0602101F Budget Activity: #1 - Technology Base
Title: Geophysics

10.(U) Project 7670, Optical/Infrared Properties of the Environment: The Air Force needs the capability to remotely sense atmospheric properties that affect electro-optical systems and also needs physical models that predict atmospheric effects on systems and operations. This project develops: (1) lidar technology to measure atmospheric properties from space; (2) tools to predict the impact of the atmosphere on DOD weapon and surveillance systems; and (3) models, data bases, and scene generators of the celestial space background for spacecraft detection and tracking systems.

(U) FY 1990 Accomplishments:
- (U) Transitioned models which predict atmospheric propagation and emission over various paths and atmospheric conditions.

(U) FY 1991 Planned Program:
- (U) Complete modeling of atmospheric turbulence and the global aerosol climatology studies.
- (U) Release the GL-developed molecular spectroscopic data base which has been accepted as the DOD standard.

(U) FY 1992 Planned Program:
- (U) Extend lidar atmospheric measurements to the Pacific Ocean.
- (U) Add infrared measurements of the earth's limb to infrared background models.

(U) FY 1993 Planned Program:
- (U) Design new eye-safe lidar for atmospheric characterization measurement from the FISTA research aircraft.
- (U) Complete models that characterize turbulence-induced effects on atmospheric transmission.

(U) Work Performed By: This project is managed by and is the technical activity of the Geophysics Directorate of AFSC's Phillips Laboratory, Hanscom AFB MA. The contractors are Visidyne, Burlington MA; Utah State University, Logan UT; Sparta Inc., Laguna Hills CA; Rockwell International, Anaheim CA; and Optimetrics, Inc., Ann Arbor MI.

(U) Related Activities:
(U) Program Element 0305160F, Defense Met. Satellite Program.
(U) Program Element 0601102F, Defense Research Sciences.
(U) Program Element 0603402F, Space Test Program.
(U) Program Element 0603707F, Weather Systems Advanced Dev.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
06ML Laboratory Operations	20,579	21,011	21,452	21,903	Cont	TBD
2417 Thermal Protection Materials and Structures	2,876	3,277	3,562	3,833	Cont	TBD
2418 Metallic Structural Materials	15,606	16,142	16,604	17,865	Cont	TBD
2419 Nonmetallic Structural Materials	5,083	5,399	5,369	5,777	Cont	TBD
2420 Aerospace Propulsion Materials	4,377	5,820	5,598	6,024	Cont	TBD
2421 Fluids, Lubricants and Elastomeric Materials	1,883	2,016	2,304	2,479	Cont	TBD
2422 Protective Coatings and Materials	3,305	3,929	4,489	4,830	Cont	TBD
2423 Electromagnetic Windows and Electronic Materials	4,806	5,111	5,757	6,195	Cont	TBD
4084 Ballistic Missile Materials	0	0	3,100	5,000	Cont	TBD
4085 Space Subsystem Materials	0	0	1,000	1,700	Cont	TBD
TOTAL	58,515	62,705	69,235	75,606	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Program Element contains the entire Air Force Exploratory Development program in materials and related technologies. It is the primary source of advanced materials to reduce life cycle costs and improve performance, supportability, reliability, survivability, and affordability of current and future Air Force systems and support equipment. It develops new and improved structural and non-structural materials, processes for making them, and repair and nondestructive inspection/evaluation technologies. It also applies advanced computer technology to manufacturing, from product design to processing of materials which now often are in the shape of the end product. The goal is to cut weapon production costs by half. Product design modules include design-for-producibility-and-inspectibility, and single-step production tooling design. The capability to predict materials behavior during manufacturing processes must be developed before the single-step production tooling design module can be completed. Two new projects will start in FY 1992. Project 4084, Ballistic Missile Materials, will develop materials for application to strategic missiles and Project 4085, Space Subsystem Materials, will develop materials for space subsystems, such as spacecraft bus structures and phased array antenna backup structures.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06ML, Laboratory Operations: Provides management and operational support for the Wright Laboratory,Materials

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

2. (U) Project 2417, Thermal Protection Materials and Structures: Develops carbon-carbon composites (CCCs) and constituent fibers/matrix resins for structural and thermal protection applications in advanced Air Force aerospace systems and components, which are exposed to intense operating conditions (oxidizing environments of 2800°-4000°F, high Mach erosion, high stress levels). Develops processes for making these materials and coatings to extend their operational life.

(U) FY 1990 Accomplishments:
- (U) Developed approach for low cost, 3500°F capable, structurally efficient CCCs.
- (U) Transitioned advanced matrix resins, strengthening mechanisms for two-dimensional CCCs, and oxidation protection techniques into ongoing manufacturing science effort on CCCs.

(U) FY 1991 Planned Program:
- (U) Continue developing oxidation resistant (OR) CCCs for gas turbine engines/spacecraft systems and the nondestructive evaluation techniques and life limiting parameters for them.
- (U) Evaluate concepts for advanced overlays, nosetips, and heat shields for advanced reentry vehicles.

(U) FY 1992 Planned Program:
- (U) Complete preliminary rule base to "intelligently process" CCCs for reproducible mechanical and durability properties.
- (U) Begin developing analytical models for predicting mechanical/oxidative behavior and life of OR CCCs.

(U) FY 1993 Planned Program:
- (U) Define critical failure modes of OR CCCs and develop coating/inhibition techniques to eliminate the failure modes.
- (U) Start to develop advanced processing methods to cut the cost of making CCC spacecraft structures to half the 1990 cost.
- (U) Begin to develop processing science for applying OR coatings on CCCs for turbine engines/high Mach airframe applications.

(U) Work Performed By: Major contractors are Textron Inc/AVCO Specialty Materials, Lowell, MA; General Electric, Cincinnati, OH; Nichols Research Corp, Huntsville, AL; Aerojet Corp, Sacramento, CA; and MSNW Inc, San Marcos, CA. The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages this project.

(U) Related Activities:
- (U) Program Element #0603112F, Adv Materials for Weapon Systems.
- (U) Program Element #0603211F, Aerospace Structures.
- (U) Program Element #0708011F, Industrial Base Program.
- (U) No duplication of effort within the Air Force or the DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2418, Metallic Structural Materials: Develops advanced metallic materials and metal matrix composites (MMCs) with optimum combinations of properties from cryogenic temperatures to 1800°F (a 600°F improvement) for tactical, and hypersonic vehicle structures, turbine engines, and missiles. Develops processes for making these materials, engineering properties, and repair

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

and nondestructive inspection (NDI) technologies. Applies advanced computer technology to manufacturing, from product design to processing of materials, with the goal of reducing weapon production costs by half. This includes adding self-learning to the previously developed Quantitative Process Automation (QPA) system and development of diagnostic sensors that monitor critical materials processing parameters. Provides quick response solutions and failure analyses to MAJCOMS and product divisions, including accident investigations.

(U) FY 1990 Accomplishments:
- (U) Completed NDI techniques for turbine engine coatings.
- (U) Cut furnace temperature variations 50% with QPA for more reproducible molecular beam growth of electronic materials.
- (U) Transitioned environmentally acceptable paints and primers (50% less volatile organic compounds) and polyalphaoletin dielectric heat transfer fluid (to SAC, saves $950M over next 25 years in reduced maintenance and fluid costs)

(U) FY 1991 Planned Program:
- (U) Begin to measure the time dependent mechanical properties of alpha-2 titanium aluminides to learn their usable life.
- (U) Finish solid state X-ray imaging technology for effort on portable real-time filmless X-ray NDI system.
- (U) Begin to determine detection limits of dual-energy computed tomography for finding hidden corrosion under fasteners.
- (U) Begin effort to apply QPA techniques to press form parts.
- (U) Complete effort to reduce variability in titanium castings for potential 50% cost/weight savings over non-cast parts.

(U) FY 1992 Planned Program:
- (U) Initiate effort to develop more ductile gamma titanium aluminide alloys for turbine engines and hypersonic vehicles.
- (U) Complete evaluation of the damage tolerance behavior of alpha-2 titanium aluminides (alpha-2).
- (U) Begin to identify non-ultrasonic nondestructive inspection (NDI) methods to quantitatively characterize adhesive bonds.
- (U) Begin to identify novel NDI methods for characterizing hidden corrosion.
- (U) Complete development of self-learning Quantitative Process Automation (QPA) system for curing composite parts.
- (U) Complete joining/repair techniques for high temperature organic matrix composites.

(U) FY 1993 Planned Program:
- (U) Complete developing coatings to protect alpha-2 from oxidation above 1200°F to survive operational environments.
- (U) Begin to obtain fatigue/fracture behavior of gamma titanium aluminide (gamma) metal matrix composites (MMCs) for an FY 94 effort on damage tolerant designs using gamma.
- (U) Begin to investigate relationships between reinforcing fibers, matrix materials, and their interfaces in gamma MMCs to obtain 1800°F capable materials.
- (U) Complete developing NDI techniques to quantitatively characterize strength-reducing brittle phases in titanium alloys.
- (U) Begin to develop technology to nondestructively determine critical mechanical properties; success allows development of NDI units that detect deterioration of these properties during manufacturing or in-service in weapon systems.
- (U) Complete effort to apply QPA to molecular beam epitaxial growth of electronic materials.

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

- (U) Demonstrate next-day-production of a part designed using the computerized design system (currently a two week effort).
- (U) Begin to develop materials/processes/equipment for on-aircraft repair of large area damage (6 inches or more in diameter) on composite structures.

(U) Work Performed By: Major contractors are University of Dayton, Dayton, OH; Universal Technology Corp, Dayton, OH, Systran Corp, Dayton, OH; Metacut Research Associates, Inc, Cincinnati, OH; and Universal Energy Systems, Dayton, OH. The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages the project.

(U) Related Activities:
(U) Program Element #0603112F, Adv Materials for Weapon Systems.
(U) Program Element #0603211F, Aerospace Structures.
(U) Program Element #0708011F, Industrial Base Program.
(U) No duplication of effort within the Air Force or the DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 2419, Nonmetallic Structural Materials: Develops advanced organic matrix composite materials, and processes for making them, for use in aerospace structural applications from -427°F to 700°F. Emphasis on increased strength, stiffness, temperature capability, and durability and reduced weight and cost. Includes developing ordered polymer films, molecular composites (materials reinforced with rigid rod molecules), and signature reduction materials.

(U) FY 1990 Accomplishments:
- (U) Demonstrated, for the first time, growth of 1.2 inch thick, 6 inch wide molecular composite (MC) films.
- (U) Demonstrated new nonlinear optical polymers with up to 40 times higher third order nonlinear properties.

(U) FY 1991 Planned Program:
- (U) Begin to develop advanced processing techniques to reduce weight and cost of MC materials.
- (U) Complete development of first generation ultra lightweight composites that are 40% lighter than current composites.

(U) FY 1992 Planned Program:
- (U) Define processing techniques to achieve self-consolidatability of molecular composite films into usable material forms.
- (U) Complete process development on thermoplastic composite aircraft structural parts; transfer to industry/DOD programs.
- (U) Begin applying Quantitative Process Automation to processing of composite parts to control dimensional tolerances.

(U) FY 1993 Planned Program:
- (U) Complete developing lower cost MCs made without solvents that have the same mechanical properties as current MCs.
- (U) Complete identification of polymer material structures that have optimum nonlinear optical properties.
- (U) Begin to develop processing methods to consolidate historically unconsolidatable (intractable) 800°F capable polymers.

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

(U) Work Performed By: The major contractors are University of Dayton, Dayton, OH; Systems Research Laboratories, Dayton, OH; Dow Chemical Co, Midland, MI; Adtech System Research, Inc, Fairborn, OH; and DuPont Co, Wilmington, DE. The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages the project.

(U) Related Activities:
(U) Program Element #0603112F, Adv Materials for Weapon Systems.
(U) Program Element #0603211F, Aerospace Structures.
(U) Program Element #0708011F, Industrial Base Program.
(U) No duplication of effort within the Air Force or the DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 2420, Aerospace Propulsion Materials: Develops ceramic matrix composites (CMCs) and advanced intermetallic (IM) alloys and metal matrix composites (MMCs), and processes for making them, for lightweight uncooled turbine engine components used at very high temperatures. Improves engine producibility, durability, thrust-to-weight, life cycle costs, fuel use.

(U) FY 1990 Accomplishments:
- (U) Developed analytical models describing a chemical vapor infiltration method for making CMCs more cost effectively.
- (U) Demonstrated improved fracture toughness in a 2850°F capable IM (Nb_5Si_3) to improve durability in turbine engines.

(U) FY 1991 Planned Program:
- (U) Begin to synthesize/evaluate new reinforcing fibers for CMCs to improve high temperature (+3000°F) mechanical properties.
- (U) Start developing lower cost processing methodologies that retain desirable operational properties of advanced IM MMCs.

(U) FY 1992 Planned Program:
- (U) Complete effort to identify CMCs for use above 3000°F.
- (U) Begin to develop improved IM matrix materials for usable MMCs that will have balanced room temperature damage tolerance and high temperature strength.
- (U) Start evaluating behavior of CMCs using reinforcing fibers from the FY 91 program.

(U) FY 1993 Planned Program:
- (U) Start to evaluate processing conditions for making turbine engine components from advanced IM MMCs.
- (U) Begin to evaluate the behavior of CMCs from the FY 92 program under anticipated operating conditions.

(U) Work Performed By: The major contractors are Southern Research Institute, Birmingham, AL; United Technologies Corp, West Palm Beach, FL; Allied Signal Garrett Engine Division, Phoenix, AZ; General Motors Corporation, Indianapolis, IN; and General Electric Company, Cincinnati, OH. The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages this project.

(U) Related Activities:
(U) Program Element (PE) #0602203F, Aerospace Propulsion.
(U) PE #0603112F, Advanced Materials for Weapon Systems.
(U) PE #0603202F, Aerospace Propulsion Subsystem Integration.

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

(U) PE #0603216F, Aerospace Propulsion and Power Technology.
(U) No duplication of effort within the Air Force or the DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 2421, Fluids, Lubricants, and Elastomeric Materials: Develops advanced fluids, lubricants, seals, sealants, and fluid containment systems, together with an understanding of their behavior and performance, for application to aircraft, spacecraft, and missile systems. Improves nonflammability and low temperature fluidity of fluids and lubricants.

(U) FY 1990 Accomplishments:
- (U) Transitioned a halocarbon based 350°F/8000 psi nonflammable hydraulic fluid to aircraft product divisions.
- (U) Identified candidate solid lubricant that continue to work when repeatedly cycled between ambient temperature and 1200°F.

(U) FY 1991 Planned Program:
- (U) Identify/synthesize candidate 700°F liquid lubricant seals (a 150° to 200°F improvement).
- (U) Begin to develop improved methods to obtain critical thermophysical and tribological properties for liquid lubricant base fluids/additives to improve lubrication behavior prediction capabilities and lower lubricant development costs.

(U) FY 1992 Planned Program:
- (U) Develop base material for high temperature elastomeric seals.
- (U) Initiate high temperature static elastomeric seal development.
- (U) Continue development of wide temperature range (-65 to 700°F liquid lubricants and compatible seals.

(U) FY 1993 Planned Program:
- (U) Develop candidate 700°F engine oils (+300°F in capability).
- (U) Begin to develop -60°F to 1500°F capable solid lubricants and methods for applying them as films, free-flowing powders, and self-lubricating compacts.

(U) Work Performed By: The major contractors are University of Dayton, Dayton, OH; Ultrasystems, Inc., Irvine, CA; Sperry Rand Corp, Glendale, AZ; Signal Research Corp, DesPlaines, IL; and ScotFoam Corp, Eddystone, PA. The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages this project.

(U) Related Activities:
(U) Program Element (PE) #0603202F, Aerospace Propulsion Subsystem Integration.
(U) PE #0603216F, Aerospace Propulsion and Power Technology.
(U) PE #0708011F, Industrial Base Program.
(U) No duplication of effort within the Air Force or the DOD.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not Applicable.

7. (U) Project 2422, Protective Coatings and Materials: Develops

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

materials and protective concepts to increase the survivability of aircrews and vital components of aircraft, and tactical missiles, in natural and threat environments.

(U) FY 1990 Accomplishments:
- (U) Completed development of multi-threat survivable spacecraft coatings and multi-layer insulation blanket materials.
- (U) Transitioned multiline narrow band rejection laser hardening filter materials to component validation programs.

(U) FY 1991 Planned Program:
- (U) Begin developing bio-organic synthesis techniques to apply optical filters on large area optics to harden them.
- (U) Bring unique materials optical properties measurements facility to full operational status to test protective coatings.
- (U) Begin developing laser radiation badge/dosimeter that is lighter and easy to use.

(U) FY 1992 Planned Program:
- (U) Continue developing novel molecular nonlinear optic (NLO) materials for protection concepts against laser threats.
- (U) Complete band modelling efforts for NLO multiple quantum well materials for high response speed protective concepts.
- (U) Start making prototype devices using bio-organic materials developed to protect against agile laser threats.

(U) FY 1993 Planned Program:
- (U) Continue development of bio-organic structural materials to optimize transparency characteristics for systems applications.
- (U) Transition laser radiation badge/dosimeter for ASD/RW requirement.
- (U) Initiate development of spectrally integrated aircraft coatings.

(U) Work Performed By: Major contractors are Systems Research Laboratories, Dayton, OH; Science Applications International Corp, La Jolla, CA; Rockwell International Corp, Thousand Oaks, CA; and TRW, Inc., Redondo Beach, CA. The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages the work.

(U) Related Activities:
- (U) Program Element (PE) #0603112F, Advanced Materials for Weapon Systems.
- (U) PE #0603202F, Aerospace Propulsion Subsystem Integration.
- (U) PE #0603211F, Aerospace Structures.
- (U) PE #0603216F, Aerospace Propulsion and Power Technology.
- (U) PE #0708011F, Industrial Base Program.
- (U) No duplication of effort within the Air Force or the DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not applicable.

8. (U) Project 2423, Electromagnetic Windows and Electronic Materials: Develops materials for optical, electromagnetic, and electronic subsystems for aircraft, missile systems. Also develops materials processing tactical missiles techniques and solder/packaging technologies.

(U) FY 1990 Accomplishments:

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

- (U) Completed development of two classes of polymeric materials with outstanding properties for electronic device packaging.
- (U) Completed initial assessment of candidate hard coatings for rain erosion resistant infrared optics; began efforts to exploit five of the coatings.

(U) FY 1991 Planned Program:
- (U) Continue developing and evaluating one of three materials completed by mid FY 91 for making tunable/agile lasers.
- (U) Begin to develop techniques/models to grow phosphorus containing electronic materials for devices that operate at higher frequencies with more power or lower noise.

(U) FY 1992 Planned Program:
- (U) Finish effort to grow bulk lithium triborate (nonlinear optical material for electro-optical countermeasure systems).
- (U) Finish effort on growing very large highly uniform single crystals of gallium arsenide to allow volume production of high performance microwave/microelectronic devices at lower cost and less scrappage; continue ongoing efforts.

(U) FY 1993 Planned Program:
- (U) Initiate effort on selective area epitaxial growth of semiconductor materials by direct write techniques for lower power and higher density, size, and reliability devices.
- (U) Complete growth of nonlinear optical materials for making agile lasers and effort on improving erosion resistance of long wavelength infrared windows; continue other efforts.

(U) Work Performed By: Major contractors are Hughes Aircraft, Malibu, CA; University of Dayton, Dayton, OH; Canadian Commercial Corp, Ottawa, Ontario, CANADA; Westinghouse Electric, Pittsburgh, PA; and General Electric, Syracuse, NY. Wright Labor-atory, Materials Directorate, Wright-Patterson AFB, OH, manages the project.

(U) Related Activities:
(U) Program Element #0602204F, Aerospace Avionics.
(U) Program Element #0708011F, Industrial Base Program.
(U) No duplication of effort within the Air Force or the DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: A FY 90/91 $231K contract is being performed cooperatively with Canada under the Canada-US Defense Cost Sharing Program.

9. (U) Project 4084, Ballistic Missile Materials: Develops constituent fibers/matrix resins and materials for reentry vehicle (RV) nosetips, antenna windows, leading edges, control surfaces, and thermal protection systems, which are exposed to high Mach number erosion, ablation, and stresses at temperatures exceeding 5000°F). Develops processes for making these materials and coatings to extend operational capability and penetrate foreign defense systems.

(U) FY 1990 Accomplishments (PE #0603311F):
- (U) Validated codes and tested RV antenna window system designs.
- (U) Manufactured and tested low thermal conductivity PAN fibers for use in RV nosetips/heatshields and rocket nozzles.
- (U) Conducted flight and underground tests of potential nosetip,

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

heatshield, and antenna window materials.

(U) FY 1991 Planned Program (PE #0603311F):
- (U) None.

(U) FY 1992 Planned Program:
- (U) Continue developing integrated nosetip/heatshield concepts to improve penetration of advanced RVs.
- (U) Complete development of advanced materials for improved signature reduction.
- (U) Begin to develop improved materials and processes for ballistic RV nosetips.
- (U) Begin to develop materials for hypervelocity maneuvering reentry vehicles.

(U) FY 1993 Planned Program:
- (U) Complete development of the integrated nosetip/heatshield concepts for improved penetration.
- (U) Start to make advanced RV material ground test articles.
- (U) Begin to develop advanced dielectric materials and improved coatings for improved signature control.

(U) Work Performed By: The major contractors are Textron Defense Systems, Wilmington, MA; Textron Specialty Materials, Lowell, MA; General Electric Co, Valley Forge, PA; Nichols Research Corp, Huntsville, AL; McDonnell Douglas, Huntington Beach, CA; and Science Applications International Corp, San Diego, CA. The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages the project.

(U) Related Activities:
(U) Program Element (PE) #0601101E, Defense Research Sciences.
(U) PE #0603311F, Ballistic Missile Technology.
(U) No duplication of effort within the Air Force or the DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

10. (U) Project 4085, Space Subsystem Materials: Develops dimensionally stable lightweight materials for space subsystems, such as phased array antenna backup structures, spacecraft bus structures, and advanced thermal management systems. Includes development of graphite thermoplastics (GR/TP), carbon-carbon composites (CCCs), and constituent fibers/resins that will survive exposure to hostile natural and threat environments.

(U) FY 1990 Accomplishments:
- (U) None.

(U) FY 1991 Planned Program:
- (U) None.

(U) FY 1992 Planned Program:
- (U) Begin to develop composite materials that will be dimensionally stable within 1/20th of the operating wavelength of a phased array antenna during its entire orbit, 20 percent lighter than current antenna structures, and a 10 year operational lifetime.
- (U) Begin a joint Air Force/Navy/NASA CCC thermal radiator

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

material program, which includes developing thin gauge high thermal conductivity materials, multifunctional environmental resistant coatings, joints/attachment materials, and low cost fabrication techniques.

(U) FY 1993 Planned Program:
- (U) Begin to develop test procedures that can assure space system materials will have a 10 year operational lifetime in only one or two years of testing.
- (U) Begin to develop smart skin materials for use on a space based radar.
- (U) Continue to develop dimensionally stable composite materials for phased array antenna backup structures and CCC thermal radiator materials.

(U) Work Performed By: To be determined by competitive source selection in FY 1992. The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, will manage this project.

(U) Related Activities:
(U) Program Element #0603401F, Advanced Spacecraft Technology.
(U) Program Element #0603428F, Space Subsystems Technology.
(U) No duplication of effort within the Air Force or the DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602201F Budget Activity: #1 - Technology Base
PE Title: Aerospace Flight Dynamics

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
06FF Directorate Operations	37,652	39,449	41,750	41,417	Cont	TBD
2401 Structures and Dynamics	7,010	5,948	7,905	8,557	Cont	TBD
2402 Vehicle Equipment	4,512	4,508	5,882	6,326	Cont	TBD
2403 Flight Control	7,471	6,578	8,790	9,533	Cont	TBD
2404 Aeromechanics	6,258	5,538	7,329	7,922	Cont	TBD
3038 Technology Integration and Assessment	5,443	0	0	0	0	18,376
Total	68,346	62,021	71,656	73,755	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program provides affordable flight vehicle technologies to improve current air vehicles and to design and develop future flight vehicles. Aeromechanics, structures, flight control, and subsystems technologies are developed, with particular emphasis placed on capabilities for global force projection, hypersonics, and "kill and survive." Project 3038 has been terminated.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06FF, Directorate Operations: This project provides for the management, support, and operation of the Flight Dynamics Directorate of Wright Laboratory, Wright-Patterson AFB, OH. It provides for the pay and related costs for civilian scientists, engineers, and support personnel; transportation of equipment; rents; communications and utilities costs; travel; and procurement of supplies, equipment, and support services.

2. (U) Project 2401, Structures and Dynamics: This project creates more supportable and survivable aerospace structures, investigates new structural concepts, and exploits new materials and fabrication processes to strengthen aerospace vehicle structures while reducing weight and cost.

(U) FY 1990 Accomplishments:
- (U) Demonstrated structural damping techniques to increase pointing/tracking accuracy of space structure.
- (U) Analyzed laser vulnerability of aircraft structure.
- (U) Activated extreme temperature/high load test facility.
- (U) Developed methods to assess aging aircraft structural risk.

Program Element: #0602201F Budget Activity: #1 - Technology Base
Title: Aerospace Flight Dynamics

(U) FY 1991 Planned Program:
- (U) Develop structural test methods for determining hypersonic vehicle life in severe acoustic/temperature environments.
- (U) Demonstrate aircraft fuel tank sealing concepts through a full-scale F-15 fatigue test.

(U) FY 1992 Planned Program:
- (U) Investigate hypersonic vehicle structural concepts.
- (U) Develop extreme temperature test methods to support design and analysis of hydrogen-actively-cooled hypersonic structures.
- (U) Develop methods for "smart" airframe structure to convey real-time structural health and capability information to pilots and maintainers (improves readiness/supportability).
- (U) Demonstrate new inspection and repair concepts for composite structures to improve aircraft supportability.
- (U) Assess ballistic/laser vulnerability of thermoplastics.
- (U) Apply damping technology to solve fatigue problems in operational aircraft (e.g. C-5, F-15).

(U) FY 1993 Planned Program:
- (U) Develop methods to predict and control flutter in hypersonic vehicle structures.
- (U) Develop thermomechanical analysis techniques to enable use of new structural design codes for hypersonic vehicles.
- (U) Demonstrate "smart" airframe structures technology.
- (U) Apply technology to prevent buffet damage on fighter aircraft (e.g. F-15, F-18).
- (U) Employ computational fluid dynamics (CFD) technology to predict aircraft structural loads.

(U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright-Patterson AFB OH. The top five contractors are Northrop, Hawthorne CA; McDonnell Douglas, St Louis MO; General Dynamic, Ft Worth TX; Boeing, Wichita KS; Lockheed, Los Angeles CA.

(U) Related Activities:
(U) PE #0601101F, In-House Laboratory Independent Research.
(U) PE #0602102F, Materials.
(U) PE #0602204F, Aerospace Avionics.
(U) PE #0603211F, Aerospace Structures.
(U) PE #0603224C, Survivability, Lethality, and Key Technologies.
(U) PE #0603269F, National Aero-Space Plane.
(U) PE #0708026F, Product Reliability and Maintainability (PRAM).
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in thousands): Not Applicable.

Program Element: #0602201F Budget Activity: #1 - Technology Base
Title: Aerospace Flight Dynamics

(U) International Cooperative Agreements: This project has cooperative (non-financial) agreements with Republic of Korea, France, Spain, Brazil, Germany, and UK. Other cooperation occurs through The Technical Cooperation Program (UK, Canada, Australia, New Zealand).

3. (U) Project 2402, Vehicle Equipment: This project reduces subsystem and component life-cycle-cost, improves vehicle and crew member survival in dangerous environments, and improves subsystem performance to make current and future flight vehicles more capable.

(U) FY 1990 Accomplishments:
- (U) Established F-15 and F-16 subsystems failure database.
- (U) Developed & validated analytical tools to enable design of safer supersonic (high temperature) canopies/windshields.
- (U) Tested a new 350 MPH tire (for hypersonic vehicles) and established first-ever design guidelines.

(U) FY 1991 Planned Program:
- (U) Develop advanced chem/bio pilot protection system.
- (U) Devise autonomous cargo loading and unloading concepts.
- (U) Develop design methods for injection molded windshields.
- (U) Develop and evaluate longer life landing gear tires.

(U) FY 1992 Planned Program:
- (U) Simulation test a closed vapor cycle environmental control system to show 10% fuel savings (i.e. increased range).
- (U) Develop analytical tools to extend operational life of aircraft tires and thus reduce aircraft life cycle cost.
- (U) Analyze failures of mechanical subsystems and components to establish better life prediction tools and reduce mishaps.
- (U) Develop the architecture for subsytems integration to eliminate thermal problems and thus improve reliability.
- (U) Develop computational fluid dynamics (CFD) methods to model separation of crew escape modules from hypersonic vehicles.
- (U) Develop assessment and repair techniques for battle damaged aircraft subsystems.

(U) FY 1993 Planned Program:
- (U) Build and test a full-scale injection molded canopy for the F-16 (canopy is a primary cost-of-ownership driver) to double canopy service life and reduce cost tenfold.
- (U) Develop and demonstrate an autonomous, on-board cargo loading/unloading system.
- (U) Establish laboratory durability test criteria to enable sub-scale transparency testing -- thus reducing test costs.
- (U) Develop and evaluate a lightweight landing gear concept for hypersonic vehicles.
- (U) Demonstrate new battle damage assessment/repair techniques.

Program Element: #0602201F Budget Activity: #1 - Technology Base
Title: Aerospace Flight Dynamics

(U) Work Performed By: This project is managed by the Flight Dynamics Directorate of Wright Laboratory, Wright Patterson AFB OH. The top five contractors are General Dynamics, Fort Worth TX; Garrett Corp, Torrence CA; Canadian Commercial Corp, Ottawa CN; McDonnell Douglas, St Louis MO; Computer Technology Associates, Denver CO.

(U) Related Activities:
(U) PE #0601101F, In-House Laboratory Independent Research.
(U) PE #0602202F, Human Systems Technology.
(U) PE #0603205F, Flight Vehicle Technology.
(U) PE #0603220C, Strategic Defense Initiative.
(U) PE #0603231F, Crew Systems Technology.
(U) PE #0604212F, Aircraft Equipment Development.
(U) PE #0604609F, Reliability and Maintainability Technology Insertion Program (RAMTIP).
(U) Joint Technical Coordinating Group on Aircraft Survivability.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in thousands): Not Applicable.

(U) International Cooperative Agreements: One USAF/Canadian government project agreement is developing an integrated closed-loop environmental control system. A second is developing and demonstrating an autonomous aircraft ground refueling capability. Funding for both programs is split 50/50 between USAF and Canada.

4. (U) Project 2403, Flight Control: This project develops technology to: (a) enable the pilot to get the most performance from his aircraft under all conditions; (b) integrate information from subsystems and the cockpit for enhanced effectiveness and situation awareness; and (c) provide robust capability to control aircraft through the "fog of war" (control surfaces failed, cables severed, etc.).

(U) FY 1990 Accomplishments:
- (U) Upgraded in-house simulation capability for the air combat environment incorporating up to six pilots & ten aircraft.
- (U) Ground tested a low-cost actuator for transport aircraft.
- (U) Performed free-flight wind tunnel tests of forebody vortex control devices that increase fighter agility.
- (U) Completed passive autonomous landing guidance design study.

(U) FY 1991 Planned Program:
- (U) Develop better pilot decision aiding controls & displays.
- (U) Determine Ada flight control hardware requirements; flight test Ada fault-tolerant flight control system on an A-7.
- (U) Develop methods for estimating stability & control of flight vehicles at (1) high angle of attack or (2) hypersonic speeds.

Program Element: #0602201F Budget Activity: #1 - Technology Base
Title: Aerospace Flight Dynamics

(U) FY 1992 Planned Program:
- (U) Explore concepts for manned hypersonic vehicle cockpits.
- (U) Begin operations of the Variable In-Flight Stability Test Aircraft (VISTA) F-16 in-flight simulator aircraft.
- (U) Flight demonstrate millimeter wave radiometer as passive image sensor for covert landing guidance. Fuse with infrared camera output for all-weather autonomous landing guidance.
- (U) Perform real time, piloted simulator assessment of adaptable route planning capability for multi-crew aircraft.
- (U) Apply "robust" control theory to demonstrate more reliable control of an agile aircraft.
- (U) Develop and bench test new flight control system concepts to expand F-16 turning performance beyond current limits.
- (U) Determine control requirements for tailless (i.e. less observable) fighters.

(U) FY 1993 Planned Program:
- (U) Complete database to enable design of forebody vortex control systems to enhance maneuverability of existing aircraft.
- (U) Develop standard maneuvers for evaluating the performance of supermaneuverable fighter aircraft.
- (U) Publish aircraft agility design guide.
- (U) Publish design guide for coordinating vehicle (subsystems) control and flight path (propulsion/maneuver) control.
- (U) Explore full integration of critical onboard systems to improve mission effectiveness and reliability.

(U) Work Performed By: This project is managed by the Flight Dynamics Directorate of Wright Laboratory, Wright Patterson AFB OH. The top five contractors are McDonnell Douglas, St Louis MO; Northrop, Hawthorne CA; Honeywell, Minneapolis MN; Calspan, Buffalo NY; System Technology Corp, Dayton OH.

(U) Related Activities:
- (U) PE #0601101F, In-House Laboratory Independent Research.
- (U) PE #0602202F, Human Systems Technology.
- (U) PE #0602204F, Aerospace Avionics.
- (U) PE #0602301E, Defense Advanced Research Projects Agency.
- (U) PE #0603205F, Aerospace Vehicle Technology.
- (U) PE #0603245F, Advanced Flight Technology Integration.
- (U) PE #0603269F, National Aero-Space Plane.
- (U) PE #0604237F, Variable Stability In-Flight Simulator Test Aircraft (VISTA).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in thousands): Not Applicable.

(U) International Cooperative Agreements: None.

Program Element: #0602201F Budget Activity: #1 - Technology Base
Title: Aerospace Flight Dynamics

5. (U) Project 2404, Aeromechanics: This project develops aerodynamic design and airframe-propulsion integration technologies for current and future flight vehicles, focusing on speed regimes ranging from subsonic to hypersonic. The technologies developed reduce cost; improve range and payload to yield enhanced global force projection; and improve manueverability while reducing observability to help pilots "kill and survive". This project also develops computational fluid dynamics (CFD), a DOD Critical Technology.

(U) FY 1990 Accomplishments:
- (U) Developed a CFD method to model high angle-of-attack/rapid maneuvering flight and used it to evaluate two F-16 modifications.
- (U) Completed wind tunnel tests and developed the first real-gas validation database to enable CFD codes to more accurately predict hypersonic vehicle performance.
- (U) Completed low observable inlet design database.

(U) FY 1991 Planned Program:
- (U) Develop methods to permit rapid (days versus months) aerothermo-dynamic evaluation of hypersonic vehicles.
- (U) Build CFD tool to integrate hypersonic airframe-propulsion.
- (U) Reduce CFD computer time five-fold to improve flow prediction capabilites and cut weapon system development cost.
- (U) Model inlet boundary layer management to reduce signature.

(U) FY 1992 Planned Program:
- (U) Develop database of aircraft geometries to enable use of emerging CFD tools to respond to operators' needs.
- (U) Investigate design concpets for efficient hydrocarbon-fueled hyper-cruisers for enhanced global force projection.
- (U) Investigate new airframe/propulsion design concept to meet hover requirements of Special Operations Forces transports.
- (U) Develop design criteria to reduce twin nozzle screech and eliminate damage caused by this severe acoustic vibration.
- (U) Develop design criteria for a low cost, low observable (LO), lightweight vectoring exhaust nozzle (pitch and yaw).
- (U) Develop advanced flow-control devices to improve manuever-ability and enable design of tailless (i.e. LO) aircraft.

(U) FY 1993 Planned Program:
- (U) Develop advanced inlets for hypersonic vehicles.
- (U) Complete reacting gas database for a hypersonic vehicle.
- (U) Develop experimental database for leeside flow separation to enable improved CFD design of hypersonic vehicles.
- (U) Experimentally validate and certify (a first for DOD) an Euler CFD code to enable wide use for design applications.
- (U) Develop elements of revolutionary "Inverse CFD" method to enable direct, requirement-driven air vehicle design.

Program Element: #0602201F Budget Activity: #1 - Technology Base
Title: Aerospace Flight Dynamics

- (U) Develop an initial configuration database for a supersonic, low observable, short takeoff/vertical landing aircraft.

(U) Work Performed By: This project is managed by the Flight Dynamics Directorate of Wright Laboratory, Wright Patterson AFB, OH. The top five contractors are McDonnell Douglas, St Louis MO; Boeing, Seattle WA; Science Applications International Corporation; General Dynamics, Fort Worth TX; and Grumman Aerospace Corp, Bethpage NY.

(U) Related Activities:
(U) PE #0601101F, In-House Laboratory Independent Research.
(U) PE #0603202F, Aircraft Propulsion Subsystem Integration.
(U) PE #0603205F, Aerospace Vehicle Technology.
(U) PE #0603245F, Advanced Flight Technology Integration.
(U) PE #0603269F, National Aero-Space Plane.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in thousands): Not Applicable.

(U) International Cooperative Agreements: This project has data exchange agreements with France (wind tunnel test methods), United Kingdom (short takeoff/vertical landing designs), Germany (CFD), and Australia (hypersonics), and is involved in the United States/Canada Defense Development Sharing Program (a 50/50 cost-share program related to highly-dynamic-flow research).

6. (U) Project 3038, Technology Integration and Assessment: This project performed technology assessment, vehicle concept synthesis, and modelling/simulation. This project has been terminated.

(U) FY 1990 Accomplishments:
- (U) Developed software to study advanced inlet/nozzle designs.
- (U) Identified applications of unmanned air vehicle technology.
- (U) Developed integrated-technology options for vertical/short takeoff & landing (V/STOL) aircraft for special operations.

(U) FY 1991 - FY 1993 Planned Program: Not Applicable.

(U) Work Performed By: Not Applicable.

(U) Related Activities: Not Applicable.

(U) Other Appropriation Funds ($ in thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602202F Budget Activity: #1 - Technology Base
PE Title: Human Systems Technology

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
06MD Armstrong Laboratory Operations	28,737	28,176	29,868	31,053	Cont	TBD
2729 Nuclear, Biological and Chemical (NBC) Defense	2,654	2,565	2,493	2,020	Cont	TBD
6302 Occupational & Environmental Toxic Hazards in AF Operations	2,354	2,715	2,849	2,883	Cont	TBD
6770 Biotechnology Studies in Advanced Systems	401	1,050	1,230	1,400	Cont	TBD
6893 Manned Weapon Systems Effectiveness	1,270	1,243	1,250	1,127	Cont	TBD
7184 Man-Machine Integration Technology	5,526	9,109	6,499	6,497	Cont	TBD
7231 Safety & Aircrew Effectiveness in Mechanical Force Environments	2,550	2,762	3,021	3,095	Cont	TBD
7755 Aerospace Medicine	663	770	700	797	Cont	TBD
7757 Radiation Hazards in Aerospace Operations	2,879	3,702	3,770	3,740	Cont	TBD
7930 Advanced Crew Technology	1,839	1,853	1,993	2,012	Cont	TBD
Total	48,873	53,945	53,673	54,624	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program focuses on human aspects of the operator interface with weapons systems. Key thrusts areas are: (1) improve the performance of the human component of weapon system operations by refining crew selection, crew protection, and man-machine integration; (2) improve safety and protect Air Force personnel from radiation, chemical, and mechanical forces; and (3) develop defense measures for air base operations, casualty care and evacuation, and personal protective equipment. The payoff is improved combat effectiveness by expanding the parameters defining operationally safe performance limits. Funding for this PE was increased by $3 million for FY 91 by congress to support evaluations of Helmet-Mounted Display systems. The research is performed in project 7184, Man-Machine Integration Technology.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06MD, Armstrong Laboratory Operations: This project provides for the management, support and operation of the Aerospace Medicine, Crew Systems and Occupational and Environmental Health Directorates of the Armstrong Laboratory. These directorates are

located at Brooks AFB TX and Wright-Patterson AFB OH. It provides for the pay and related costs of civilian scientists, engineers, and support personnel; transportation of equipment; rents; communications and utilities costs; reproduction services; and procurement of supplies, equipment, and contractor support services for these facilities. Funds support and complement all projects in this PE. This is a continuing program.

2. (U) Project 2729, Nuclear, Biological & Chemical (NBC) Defense: In the event of an NBC attack, Air Force operations would be severely impacted, largely by the reduced efficiency and increased thermal burden of the chemical warfare defense (CWD) ensemble. As the DOD lead agency, the Army is responsible for tri-service NBC research and development. Goals are to develop the technology required to address unique Air Force requirements in: analysis of NBC scenarios and determination of defense requirements; individual/collective protection; NBC detection, identification and warning; contamination control; and aircrew performance effects from NBC pretreatment or treatment drugs (in conjunction with exposure).

(U) FY 1990 Accomplishments:
- (U) Evaluated the aircrew CWD ensemble for ground crew field use with the multiman intermittent cooling system (MMICS).

(U) FY 1991 Planned Program:
- (U) Develop NATO Standardization Agreement for guidance on cockpit thermal stress and its impact on sortie generation.
- (U) Initiate development of aircraft interior decontamination and contamination avoidance procedures.
- (U) Begin study of effective work/rest cycles while using intermittent cooling in operational environments.

(U) FY 1992 Planned Program:
- (U) Concentrate in-house core effort on systems analysis/modeling.
- (U) Revise AFR 355-8 work/rest cycle recommendations.
- (U) Update aircrew drinking water (intake) requirements for various climates.

(U) FY 1993 Planned Program:
- (U) Develop standards for the Life Support SPO (6.4) chemical defense equipment development program.
- (U) Continue analysis to determine operational impact of new threats, theater threat levels, and various climates.

(U) Work Performed By: The Armstrong Laboratory at Brooks AFB TX and Wright-Patterson AFB OH perform and manage this work. Contractors are: Jaycor, San Diego CA; Systems Research Laboratory, Dayton OH; Krug International, Dayton OH; Rothe Development Inc, San Antonio TX; and Transducer Research Inc, Napierville IL.

Program Element: #0602202F Budget Activity: #1 - Technology Base
PE Title: Human Systems Technology

(U) Related Activities:
- (U) Coordination with the Armed Services Biomedical Research Evaluation and Management (ASBREM) program and a USAF position established with the US Army Medical Research and Development Command, Ft Detrick MD.
- (U) Program Element (PE) #0602205F, Training/Simulation Tech.
- (U) PE #0603231F, Crew Systems and Personnel Protection Tech.
- (U) PE #0604703F, Aeromedical/Chemical Defense Systems Dev.
- (U) PE #0604706F, Life Support Systems.
- (U) PE #0604601F, CBW Defense Equipment.
- (U) PE #0702986F, Clothing Development.
- (U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 6302, Occupational and Environmental Toxic Hazards in Air Force Operations: This project has the Air Force responsibility for the toxicological assessment of Air Force materials and processes. The goal of this project is to improve the assessment of human tolerance levels for Air Force chemicals, fuels and materials. This is required to establish appropriate exposure criteria for engineering design of new systems as well as to perform trade-off analyses between weapon systems performance and occupational health and environmental support requirements.

(U) FY 1990 Accomplishments:
- (U) Determined no-effect level for chlorotrifluoroethylene (CTFE) hydraulic fluids.
- (U) Assessed health risks associated with chronic occupational exposures to JP-8 fuel.

(U) FY 1991 Planned Program:
- (U) Evaluate potential toxicological hazards of materials considered as replacements for halons (fire suppression).
- (U) Improve risk assessment methodology for exposure to a mixture of chemicals or combined exposure routes (i.e., inhalation, ingestion, and/or skin exposure).

(U) FY 1992 Planned Program:
- (U) Improve mathematical models by incorporating a mechanism for predicting cancer following exposure to chemicals.
- (U) Develop methods to estimate penetration of chemicals through skin by extrapolation from animal models.

(U) FY 1993 Planned Program:
- (U) Improve methodologies for interspecies extrapolation of toxicological data.
- (U) Conduct toxicological risk assessments of high energy fuel.

Program Element: #0602202F Budget Activity: #1 - Technology Base
PE Title: Human Systems Technology

(U) Work Performed By: Managed by Armstrong Laboratory, Wright-Patterson AFB OH. The contractors are NSI Technology Services Corporation, Research Triangle Park NC; Fred Hutchinson Cancer Research Center, Seattle WA; ICF Inc, Fairfax VA; Technolube Products Co, Los Angeles CA; and Operational Technologies Corp, San Antonio TX.

(U) Related Activities:
(U) PE #0602720A, Environmental Quality Technology.
(U) PE #0602777A, Systems Health Hazard Prevention Technology.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 6770, Biotechnology Studies in Advanced Systems: This project provides scientific and technical support from national scientific and technical organizations, committees and tri-service groups to provide advice to in-house scientists supported by this program element, thereby ensuring high quality, meaningful, coordinated, exploratory development efforts. This includes: (1) support to coordinating agencies, and national and international resources for compiling and disseminating information on laboratory animals; (2) the National Academy of Sciences and (3) advisory groups for tri-service coordination and review of programs and semiannual reporting to the Office of the Under Secretary of Defense for Research and Engineering on tri-service research, development and applications of human factors.

(U) FY 1990 Accomplishments:
- (U) Improved tri-service coordination, specifically with the US Army Chemical Defense Program, and reduced the level of in-house research required to meet the changing threat.
- (U) Continued support of other technical advisory groups such as DoD Human Factors Engineering Technical Advisory Group.

(U) FY 1991 Planned Program:
- (U) Establish study group on high power microwaves (HPM).
- (U) Enhance the postdoctoral program to include positions in visual sciences and human physiology.
- (U) Augment Research Initiation Program in the area of artificial intelligence for training, voice communications and radiofrequency bioeffects.

(U) FY 1992 Planned Program:
- (U) Establish a study group on hypervelocity escape.
- (U) Assess state-of-the-art Human Information Process modeling applicable to C^3I systems and propose promising areas for research.

Program Element: #0602202F Budget Activity: #1 - Technology Base
PE Title: Human Systems Technology

(U) FY 1993 Planned Program:
- (U) Fund a panel to study issues surrounding unmanned vehicle operations projected to the year 2010.
- (U) Identify unique structural properties of biological materials.
- (U) Assess state-of-the-art synthesis of materials with known linear properties and propose promising areas for research.
- (U) Critically assess the potential payoff of artificial neural net techniques for incorporation into intelligent tutors.

(U) Work Performed By: Managed by the Armstrong Laboratory at Brooks AFB TX and Wright-Patterson AFB OH.

(U) Related Activities: No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 6893, Manned Weapon Systems Effectiveness: This project develops mission effective techniques to deceive the operators of enemy air-to-ground and ground-to-air systems, and investigates effects of vision and motion on aircrew performance. The goal is to protect USAF resources through the development of visual camouflage, optical countermeasures and techniques to defeat infrared and radar sensors. Measurement of enemy anti-aircraft operator performance is accomplished with simulation and flight test. Countermeasures are developed and delivered to Tactical Air Command, and USAF Europe.

(U) FY 1990 Accomplishments:
- (U) Determined the effectiveness of optical countermeasures associated with F-15 and F-16 decoy flight tests.
- (U) Assessed the threat from manned enemy systems to aircraft penetrating air base defenses.

(U) FY 1991 Planned Program:
- (U) Assess methodology to deceive infrared sensors and high resolution detection techniques of new radar systems.
- (U) Test man's capability to perform operationally-oriented visual tasks while onboard exo-atmospheric vehicles such as NASP.

(U) FY 1992 Planned Program:
- (U) Provide thermally active silhouette decoy to TAC.
- (U) Model three-dimensional dexterous hand for NASA.

(U) FY 1993 Planned Program:
- (U) Test "Ideal" Camouflage, Concealment and Deception (CC&D) Pattern.

(U) Work Performed By: Managed by Armstrong Laboratory, Wright-

Program Element: #0602202F Budget Activity: #1 - Technology Base
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Patterson AFB OH. The contractors are: Charles River Analytics, Inc., Cambridge MA and Alphatech, Inc, Burlington MA.

(U) Related Activities:
(U) PE #0602205F, Training/Simulation Technology.
(U) PE #0603227F, Advanced Simulator Technology.
(U) PE #0603231F, Crew Systems and Personnel Protection Tech.
(U) PE #0602204F, Aerospace Avionics.
(U) PE #0602702F, Command, Control, Communications.
(U) PE #0602201F, Aerospace Flight Dynamics.
(U) PE #0603205F, Flight Vehicle Technology.
(U) PE #0603245F, Advanced Fighter Technology Integration.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 7184, Man-Machine Integration Technology: This project develops procedures and technologies to optimize the interface between Air Force personnel and the weapon systems they operate. Information about the characteristics of human operators is gathered and analyzed to provide design data for system control and display development. The goal is to develop methods to simulate man's interface with machines to measure the changes in weapon effectiveness as a result of changes in man-machine coupling. This project was increased by $3 million in FY 91 to expand the scope of display evaluations to include the Agile Eye Helmet-Mounted Display (HMD) combat situation display system.

(U) FY 1990 Accomplishments:
- (U) Designed display requirements to improve night combat effectiveness for the first ejection-compatible tactical night vision system.
- (U) Evaluated design of a strategic crew station intended to enhance information displays to crew members during combat.

(U) FY 1991 Planned Program:
- (U) Develop a miniaturized helmet-mounted cathode ray tube display with full color imaging.
- (U) Produce a model of the human/visual display interface to assess speed and accuracy performance criteria.
- (U) Evaluate Agile Eye HMD system for improved pilot situational and combat awareness.

(U) FY 1992 Planned Program:
- (U) Integrate visual and audio display technologies as a precursor to Super Cockpit.
- (U) Support SAC Relocatable Target flight test.
- (U) Demonstrate a man-in-the-loop Advanced Target Acquisition (ATAS) prototype.

Program Element: #0602202F Budget Activity: #1 - Technology Base
PE Title: Human Systems Technology

- (U) Develop a miniature color CRT for helmet mounted displays.
- (U) Demonstrate a design procedure for integration of sensor displays for strategic bomber applications.

(U) FY 1993 Planned Program:
- (U) Demonstrate Strategic Relocatable Target cockpit avionics.
- (U) Develop militarized helmet mounted display connector harness.
- (U) Demonstrate strategic force management simulation using the SABER facility.
- (U) Develop an automatic sizing system for personal equipment development acquisition.

(U) Work Performed By: Managed by the Armstrong Laboratory, Wright-Patterson AFB OH. The major contractors are: Logicon, Torance CA; University of Dayton, Dayton OH; Science Applications International Corp, San Diego CA; Macaulay-Brown Inc, Dayton OH; and Search Technology, Inc. Norcross GA.

(U) Related Activities:
(U) PE #0602205F, Training/Simulation Technology.
(U) PE #0603227F, Advanced Simulator Technology.
(U) PE #0603231F, Crew Systems and Personnel Protection Tech.
(U) PE #0602204F, Aerospace Avionics.
(U) PE #0602702F, Command, Control, Communications.
(U) PE #0602201F, Aerospace Flight Dynamics.
(U) PE #0603205F, Flight Vehicle Technology.
(U) PE #0603245F, Advanced Fighter Technology Integration.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Prototype hardware to improve helmet mounted display images is under development with Canada.

7. (U) Project 7231, Safety and Aircrew Effectiveness in Mechanical Force Environments: This project determines human response to various mechanical forces including noise, impact, vibration, and hostile fire. The goal is to develop safe, effective escape/ejection systems, acceleration protection equipment restraint devices, and to reduce vulnerability of the crew station. Data for operator-centered communications, jamming, and noise exposure criteria, as well as concepts for operator control of robotic systems using remotely placed sensors are developed to improve air and ground crew performance.

(U) FY 1990 Accomplishments:
- (U) Developed specifications for cost-effective manikins for aircrew injury assessment.

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(U) FY 1991 Planned Program:
- (U) Initiate research into aircrew acceleration protection and orientation/situational awareness requirements for high agility flight and during combat maneuvers.
- (U) Develop a draft hypersonic escape system design specification to assure safe escape throughout the high altitude/high speed flight envelope of a National Aerospace Plane (NASP)-derived vehicle.

(U) FY 1992 Planned Program:
- (U) Finalize safe head/neck loading criteria in flight environment to reduce risk of neck injury to aircrew.
- (U) Develop a biofidelic manikin neck for realistic test and evaluation of aircrew helmets/helmet mounted devices.
- (U) Develop haul-back (inertial reel) design criteria for improved aircrew restraint systems.

(U) FY 1993 Planned Program:
- (U) Incorporate new jamming metric into communications effectiveness analyses and studies.
- (U) Develop lightweight Active Noise Reduction earphones for improved air/ground crew hearing protection.
- (U) Complete development of composite manikin structural elements for improved biofidelity.

(U) Work Performed By: Managed by the Armstrong Laboratory, Wright-Patterson AFB OH. The major contractors are: Systems Research Lab., Inc., Dayton OH; Dyncorp, McLean VA; Myle Lab., El Segundo CA; University of Dayton Research Institute, Dayton OH; and Indiana University Foundation, Bloomington IN.

(U) Related Activities:
(U) PE #0603231F, Crew Systems and Personnel Protection Tech.
(U) PE #0604703F, Aeromedical/Chemical Defense Systems Dev.
(U) PE #0604706F, Life Support System.
(U) PE #0604601F, CBW Defense Equipment.
(U) PE #0602204F, Aerospace Avionics.
(U) PE #0602702F, Command, Control, Communications.
(U) PE #0602201F, Aerospace Flight Dynamics.
(U) PE #0603205F, Flight Vehicle Technology.
(U) PE #0603245F, Advanced Fighter Technology Integration.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

8. (U) Project 7755, Aerospace Medicine: The human operator is the enabling factor in all aerospace systems. The goal of this project is to optimize aircrew effectiveness through: (1) research on medical conditions affecting aircrew selection and retention; (2)

Program Element: #0602202F Budget Activity: #1 - Technology Base
PE Title: Human Systems Technology

investigate methods of early disease detection, and determine the impact of disease on aircrew performance; and (3) examine therapeutic drug effects on flight safety.

(U) FY 1990 Accomplishments:
- (U) Demonstrated feasibility and safety of cycle ergometry testing for base-level personnel fitness evaluations.
- (U) Identified characteristics of available off-the-shelf spectacles to improve current aircrew spectacles to meet specific aircrew vision correction/protection needs.

(U) FY 1991 Planned Program:
- (U) Evaluate Cardiovascular Risk Index as next generation mechanism for medical aspects of force readiness.
- (U) Evaluate use of contact lenses with new aircrew masks.
- (U) Complete evaluation on cardiac disease history with Army study on Class of '56 West Point graduates.

(U) FY 1992 Planned Program:
- (U) Test feasibility of allowing aircrew members to use rigid gas permeable contact lenses.
- (U) Refine existing electrocardiogram lead placement to permit more accurate detection of asymptomatic heart disease.

(U) FY 1993 Planned Program:
- (U) Implement new neuropsychiatric NORMs to improve the accuracy of aeromedical evaluation of aircrew members.
- (U) Investigate echocardiography as a safe, non-invasive method to screen pilot candidates for structural heart defects.

(U) Work Performed By: Managed by the Armstrong Laboratory, Brooks AFB TX. The contractors are GSA contractors (OAO, Inc.) and SCEEE Services, Inc., St Cloud FL.

(U) Related Activities:
(U) PE #0603231F, Crew Systems and Personnel Protection Tech.
(U) PE #0604703F, Aeromedical/Chemical Defense Systems Dev.
(U) PE #0604706F, Life Support System.
(U) PE #0604601F, CBW Defense Equipment.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

9. (U) Project 7757, Radiation Hazards in Aerospace Operations: This project conducts research on the effects of electromagnetic and particulate radiation in aerospace operations. Research concerns safety, environmental impact, mission success and countermeasures in combat, and biologic effects of exposure to radiofrequency or microwave radiation, lasers, and ionizing radiation. Provides

Program Element: #0602202F Budget Activity: #1 - Technology Base
PE Title: Human Systems Technology

support to other DOD programs by using unique USAF resources to understand radiation effects, and extend behavioral research and operations analysis.

(U) FY 1990 Accomplishments:
- (U) Evaluated special purpose laser protective eyewear.
- (U) Developed interim DOD High Power Microwave (HPM) standard.
- (U) Published data from a 25-year study of the effects of energetic protons on biological tissue.

(U) FY 1991 Planned Program:
- (U) Provide laser biological effects information to worldwide computer simulation network for force-on-force training.
- (U) Assess safety and operational impacts of unique electromagnetic radiation (EMR) pulse propagation profiles.
- (U) Define ocular effects of millimeter waves.

(U) FY 1992 Planned Program:
- (U) Initiate support for USAF Directed Energy Master Plan.
- (U) Complete laser hazard assessment computer model for use by base safety and occupational health personnel.

(U) FY 1993 Planned Program:
- (U) Assess cancer risks of radiofrequency radiation.
- (U) Evaluate biological hardening against directed energy.
- (U) Revise safety standards for ultra-short laser pulses.

(U) Work Performed By: Managed by the Armstrong Laboratory, Brooks AFB TX. The major contractors are: Krug International, San Antonio TX; Systems Research Laboratories, San Antonio TX; University of Texas at San Antonio TX; John B. Pierce Foundation, New Haven CT; and Georgia Institute of Technology, Atlanta GA.

(U) Related Activities:
(U) PE #0603231F, Crew Systems and Personnel Protection Tech.
(U) PE #0604706F, Life Support System.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

10. (U) Project 7930, Advanced Crew Technology: This project studies human response to physiological stressors such as rapid onset sustained acceleration, spatial disorientation, altitude and thermal stress, workload, and sustained operations. Design criteria and prototype protective systems and procedures are developed to protect crew members and ensure safe, effective mission operations. Additional tasks involve the evaluation of aeromedical evacuation equipment; and the evaluation, cockpit integration, and man-rating of life support equipment.

Program Element: #0602202F Budget Activity: #1 - Technology Base
PE Title: Human Systems Technology

(U) FY 1990 Accomplishments:
- (U) Demonstrated efficacy of a non-sedating antihistamine
- (U) Developed feasibility model of hybrid oxygen system to store onboard-generated breathing gas on aircraft.
- (U) Man-rated the new COMBAT EDGE G-protection ensemble.

(U) FY 1991 Planned Program:
- (U) Develop a G-sensitivity test to predict operational capability of aircrew to tolerate G-stress.
- (U) Man-rate pressure breathing-compatible chemical (CWD) respirator for aircrew G and altitude capability in Nuclear, Biological or chemical (NBC) scenarios.
- (U) Validate best symbology to standardize head-up displays to reduce possibility of spacial disorientation (SD).
- (U) Develop training curriculum for advanced SD ground trainer to reduce SD flight accidents.

(U) FY 1992 Planned Program:
- (U) Develop recommendations/performance enhancement strategies for sustained operations crew duty cycle
- (U) Evaluate concept of an advanced on-board oxygen generation system to increase oxygen purity and reduce operational costs.
- (U) Develop an improved pressure breathing schedule for more effective emergency altitude protection for aircrews.

(U) FY 1993 Planned Program:
- (U) Apply altitude decompression model to develop operational prebreathe schedules to reduce risk of high altitude bends.
- (U) Define requirements for protection from tissue fluid vaporization at altitude (ebullism).
- (U) Identify optimum work/rest shift schedules for use in continuous operations.

(U) Work Performed By: Managed by the Armstrong Laboratory, Brooks AFB TX. Contractors are: Krug International, San Antonio TX; Arthur D. Little, Cambridge MA; Washington University, St Louis, MO; MOOG, Inc, East Aurora NY.

(U) Related Activities:
(U) PE #0603231F, Crew Systems and Personnel Protection Tech.
(U) PE #0604706F, Life Support System.
(U) PE #0604601F, CBW Defense Equipment.
(U) PE #0602201F, Aerospace Flight Dynamics.
(U) PE #0603205F, Flight Vehicle Technology.
(U) PE #0603245F, Advanced Fighter Technology Integration.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602203F Budget Activity: #1 - Technology Base
PE Title: Aerospace Propulsion

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
06PP Laboratory Operations	22,804	23,750	23,750	22,200	Cont	TBD
3012 Ramjet Technology	5,479	4,827	5,368	5,667	Cont	TBD
3048 Fuels, Lubrication and Fire Protection	8,765	9,782*	8,520**	8,088	Cont	TBD
3066 Turbine Engine Technology	22,765	19,839	23,543	26,050	Cont	TBD
3145 Aerospace Power Technology	6,081	6,337	5,684	6,062	Cont	TBD
4101 Space Power Technology***	0	0	2,490	3,455	Cont	TBD
TOTAL	65,894	64,535	69,355	71,522	Cont	TBD

* Project 3048 funding in FY 91 includes $1.5 million for development of high thermal stability and endothermic jet fuels and a $3 million Congressional addition for coal-based fuels.

** For FY 92, funds are provided for development of high thermal stability and endothermic fuels, with $2 million dedicated to coal-based jet fuels.

*** Space power work originally planned for project 3145 in FY 92 ($1.190 M) and FY93 ($1.455 M) is transferred to the new project.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element develops air breathing propulsion and aerospace power technology in support of current and future aerospace vehicles and weapon systems. The prime areas of focus are turbine engines, combined cycle engines, ramjets, fuels, lubrication, and advanced power generation and distribution. Anticipated technology advances in turbine engine components and subsystems will provide a 60% increase in engine thrust/weight and a 25-30% reduction in specific fuel consumption by 1997. Ramjet propulsion will reduce the time to target for future air launched tactical and strategic missiles by 50% and combined cycle engines will provide high Mach propulsion for manned aircraft. Advanced fuels efforts support all air-breathing weapon systems and will provide a 15 fold increase in subsystems cooling capability over current fuels. Hydraulic power and electrical power systems will produce a four-fold increase in energy-to-weight. Power conditioning, thermal management, and aircraft batteries for the "more electric aircraft" concept will significantly improve aircraft reliability and reduce weight. Laboratory operations provide technical support to advanced systems programs and undertakes operational support projects in this mission area. Projects in this program element support Air Breathing Propulsion and Pulse Power development in the DoD Critical Technology Plan.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

Program Element: #0602203F Budget Activity: #1 - Technology Base
Title: Aerospace Propulsion

1. (U) Project 06PP, Laboratory Operations: Provides management and operational support for the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson Air Force Base, OH. Includes pay and benefits for civilian scientists, engineers, and support personnel, travel, transportation, rents, communications, utilities, maintenance, and procurement of supplies and equipment.

2. (U) Project 3012, Ramjet Technology: This project develops advanced propulsion concepts in the area of ducted ramjets and solid fuel ramjets for missile propulsion; combined cycle turboramjets and air turborockets for high Mach aircraft; and hydrocarbon fueled supersonic combustion ramjets (scramjets) for hypersonic vehicles.

(U) FY 1990 Accomplishments:
- (U) Completed preliminary studies of a joint Air Force/NASA turboramjet for Mach 5-6 military/commercial engines.
- (U) Completed preliminary design studies of hydrocarbon fueled, supersonic combustion ramjet for Mach 6-7 missile applications.

(U) FY 1991 Planned Program:
- (U) Design and fabricate Air Force/NASA turboramjet components.
- (U) Develop air turborocket concept to improve missile safety and reliability by eliminating ramjet booster rockets.
- (U) Complete boron solid fuel ramjet (BSFRJ) component development which exceeds conventional liquid fueled designs.

(U) FY 1992 Planned Program:
- (U) Conduct ramburner performance tests for the Air Force/NASA turboramjet at Mach 6 conditions.
- (U) Design/fabricate piloting and fuel injectors for Mach 7 hydrocarbon scramjet missiles.
- (U) Test BSFRJ components in a rig to define combustion, performance, and efficiency at simulated flight conditions.

(U) FY 1993 Planned Program:
- (U) Rig test ceramic matrix composite compressor for Air Force/NASA turboramjet at Mach 5 conditions.
- (U) Assemble and rig test a missile sized hydrocarbon scramjet at Mach 7 conditions.
- (U) Conduct air turborocket rig test to demonstrate combustion performance/efficiency for possible missile applications.

(U) Work Performed By: This project is managed at the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The five major contractors for this project are: Atlantic Research Corp, Gainesville, VA; Chemical Systems Division, San Jose, CA; Pratt and Whitney Aircraft, West Palm Beach, FL; Hughes Aircraft, Canoga Park, CA; and Boeing Aerospace, Seattle, WA.

(U) Related Activities:
(U) PE #0603216F, Aerospace Propulsion and Power Technology.
(U) Government/industry/academia efforts coordinated by joint projects, information exchanges, and the Joint Army-Navy-Air Force (JANNAF) Interagency Propulsion Committee.

Program Element: #0602203F Budget Activity: #1 - Technology Base
Title: Aerospace Propulsion

(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: French DEA-90-F-7347 and German DEA AF-90-G-7461.

3. (U) Project 3048, Fuels, Lubrication and Fire Protection: This project develops a) improved Air Force fuels and the understanding of fuel/system capabilities and b) lubricants, lubrication components and techniques. The lubrication effort supports the Integrated High Performance Turbine Engine Technology (IHPTET) program (see project 3066).

(U) FY 1990 Accomplishments:
- (U) Developed methodology to characterize additives to increase the temperature limit of JP-8 fuel by 100 F (to 425 F).
- (U) Completed development of a high temperature, solid lubricated ceramic roller bearings for missile engines.
- (U) Characterized coal derived fuel breakdown processes.

(U) FY 1991 Planned Program:
- (U) Demonstrate a second generation endothermic fuel concept, and transition to advanced development PE 0603216F.
- (U) Complete development of 500-hour life powder lubricated hybrid ball bearing for IHPTET Phase I demonstration.
- (U) Complete development of 700 F load capacity test for evaluation of IHPTET Phase II and Phase III lubricants.
- (U) Characterize coal derived fuel for turbine engine applications.

(U) FY 1992 Planned Program:
- (U) Rig test candidate additives to increase the temperature limit of JP-8 by 100 F (JP8+100).
- (U) Complete research on hydrocarbon fuel compounds for JP-900 that will increase heat sink capability by 500% over JP-8.
- (U) Rig test lightweight propfan gearbox with increased output horsepower for IHPTET Phase II missile engines.
- (U) Demonstrate high speed bearing/seal technology with 50% temperature and 25% speed increase for IHPTET Phase II.
- (U) Evaluate feasibility of a coal derived fuel demonstration program.

(U) FY 1993 Planned Program:
- (U) Complete rig test of JP8+100 additives and transition to PE 0603216F, project 2480, to validate with IHPTET components.
- (U) Develop endothermic catalysts to extend JP-8 and JP-10 heat sink capability for Mach 4-6 applications.
- (U) Demonstrate high speed high temperature (1200 F) ceramic roller bearings for IHPTET Phase II missile engines.
- (U) Develop counter-rotating intershaft seal for IHPTET Phase II providing a 25% improved speed at full life.
- (U) Continue basic scientific investigation of coal derived turbine engine fuels.

Program Element: #0602203F Budget Activity: #1 - Technology Base
Title: Aerospace Propulsion

(U) Work Performed By: Work is performed both in-house and with contracts managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractors for this project are: General Electric, Evendale, OH; United Technologies, East Hartford, CT, West Palm Beach FL; University of Dayton Research Institute, Dayton, OH; Allied Signal, Energy and Materials Research Center, Chicago, IL; and Penn State University.

(U) Related Activities:
- (U) PE #0603216F, Aerospace Propulsion and Power Technology.
- (U) Army, Navy, DARPA, NASA, DOE, industry, and academia research is coordinated by joint projects, the DOD Mobility Fuels Committee, and through the DOD/NASA IHPTET initiative.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 3066, Turbine Engine Technology: This project develops technology to improve propulsion operational reliability, mission flexibility, and performance while reducing weight, fuel consumption, and cost. Both analytical and experimental efforts are conducted in fans and compressors, high temperature combustors, turbines, internal flow systems, control systems, exhaust systems, and structural design. This project supports the Integrated High Performance Turbine Engine Technology (IHPTET) program. IHPTET is a three phase, totally integrated DOD, DARPA, NASA, and industry effort to double turbine engine propulsion capability (over ATF engine) by the year 2005. Each IHPTET phase will accomplish one third of the overall goal and transition interim technology to new/current weapon systems during the program.

(U) FY 1990 Accomplishments:
- (U) Successfully demonstrated a turbine for cruise missile engines at IHPTET Phase II design conditions.
- (U) Fabricated a high-temperature 600 F engine inlet guide vane actuator which reduces component weight by over 50%.
- (U) Built and spin-tested a first-ever metal-matrix composite ring rotor leading to 70% lighter compressor designs.

(U) FY 1991 Planned Program:
- (U) Complete IHPTET Phase I component technology development and demonstrate 30% improvement in engine performance.
- (U) Cyclically test a metal-matrix composite rotor stage.
- (U) Demonstrate a new missile engine compressor design to greatly reduce weight and cost while improving performance.
- (U) Test metal matrix structural support rods concept which will yield a 40% weight reduction in engine frames.

(U) FY 1992 Planned Program:
- (U) Demonstrate an enhanced flow compressor that will provide twice the flow range capability of current designs.

Program Element: #0602203F Budget Activity: #1 - Technology Base
Title: Aerospace Propulsion

- (U) Demonstrate the new in-house Advanced Turbine Aerothermodynamic Research Rig (ATARR) that will verify IHPTET turbine aerodynamic, heat transfer, and cooling goals.
- (U) Fabricate and test an advanced missile engine combustor at IHPTET Phase II operating conditions.
- (U) Demonstrate a titanium metal matrix composite engine rear frame providing a 10-20% component weight reduction.
- (U) Fabricate a new lightweight, high-temperature (900 F) actuator for use in complex multifunction exhaust nozzles.

(U) FY 1993 Planned Program:
- (U) Demonstrate a splittered rotor fan concept that will reduce the number of fan stages by 33%.
- (U) Demonstrate an advanced core driven fan concept that will double the pressure ratio per stage.
- (U) Verify aero and heat transfer design of IHPTET Phase II large engine turbines in the ATARR facility.
- (U) Complete designs for low pressure turbines for IHPTET Phase II large and small engine demonstrators.

(U) Work Performed By: Work is performed both in-house and with contracts managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractors for this project are: General Electric, Evendale, OH; Pratt & Whitney, West Palm Beach, FL and East Hartford, CT; Garrett Engine Division, Phoenix, AZ; Allison Gas Turbine Division, Indianapolis, IN; Williams International, Walled Lake, MI; and Teledyne/CAE, Toledo, OH.

(U) Related Activities:
(U) PE 0601102F, Defense Research Sciences.
(U) PE 0602102F, Materials.
(U) PE 0603211F, Aerospace Structures and Materials.
(U) PE 0603216F, Aerospace Propulsion and Power Technology.
(U) PE 0603202F, Aircraft Propulsion Subsystem Integration.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 3145, Aerospace Power Technology: Aerospace vehicles require the development of solar power, fuel cells, batteries, hydraulics, power generation, power conversion and transmission, as well as thermal management technology. A major focus of this project is the "more electric aircraft" concept aimed at improving reliability and reducing weight of power systems.

(U) FY 1990 Accomplishments:
- (U) Tested a radiation hardened and high efficiency cascade solar cell that has three times the present survivability.
- (U) Bench tested an advanced aircraft battery with a five year maintenance free life potential.

Program Element: #0602203F Budget Activity: #1 - Technology Base
Title: Aerospace Propulsion

(U) FY 1991 Planned Program:
- (U) Develop a rechargeable lithium missile silo battery to save a projected $25 million in annual operational cost.
- (U) Develop and test a Auxiliary Power Unit (APU) components for lightweight integrated power unit saving 200 lbs.

(U) FY 1992 Planned Program:
- (U) Test a high temperature superconductor power component with potential to reduce generator weight and volume by 5 fold.
- (U) Develop a power subsystem for the "more electric aircraft" concept that will enable a 2 to 5 times improvement in reliability, maintainability, and survivability.
- (U) Complete electrical tests on second generation, high speed, high power switch for "more electric aircraft" concept.

(U) FY 1993 Planned Program:
- (U) Initiate cyclic testing of the rechargeable Lithium battery to demonstrate its practical use in missile silos.
- (U) Complete integral starter/generator rig tests to improve aircraft reliability/weight by eliminating gearboxes.
- (U) Conduct radiation hardened verification test on high speed, high power switch for "more electric aircraft" concept.

(U) Work Performed By: Work is performed both in-house and with contracts managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractors for this project are: General Electric, Schenectady, NY; Eagle-Picher Ind, Joplin, MO; Research Triangle Inst., Research Triangle Park, NC; and Loral EOS Inc, Pasadena, CA.

(U) Related Activities:
- (U) PE #0603216F, Aerospace Propulsion and Power Technology.
- (U) PE #0603311F, Ballistic Missile Technology.
- (U) Programs are coordinated with the Interagency Power Group, an Air Force, Army, Navy, NASA, and DoE committee.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 4101, Space Power Technology: This is a new project to specifically develop power technology for space applications. The focus of this project is to develop unique power generation storage and conditioning techniques for advanced satellites. This work is not redundant to any activities sponsored by the Strategic Defense Initiative (SDI) program and includes space related power work transferred from project 3145.

(U) FY 1990 Accomplishments: Not applicable, new project.

(U) FY 1991 Planned Program: Not applicable, new project.

(U) FY 1992 Planned Program:

Program Element: #0602203F Budget Activity: #1 - Technology Base
Title: Aerospace Propulsion

- (U) Initiate development of high energy density/high discharge rate batteries.
- (U) Initiate development of fault tolerant, pulse forming power distribution and conditioning components.
- (U) Test multi-junction solar cell concept which could reduce costs by 40%, double efficiency, and improve survivability.

(U) FY 1993 Planned Program:
- (U) Bench test new battery concepts to improve energy storage by a factor of five over current nickel-hydrogen batteries.
- (U) Complete design for power distribution, conditioning, and pulse forming subsystem networks.

(U) Work Performed By: Work will be performed both in-house and with contracts managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractors for this project will be selected by competitive procurement.

(U) Related Activities:
(U) PE 0603428F, Space Sub-system Technology.
(U) PE 0603401F, Advanced Spacecraft Technology.
(U) This is a well coordinated effort and there is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602204F Budget Activity: # 1 - Technology Base
PE Title: Aerospace Avionics

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
06AA, Laboratory Operations	36,090	39,110	39,857	39,646	Cont	TBD
2000, Active Electronic Countermeasures	2,777	2,832	3,380	3,492	Cont	TBD
2001, Electro Optical Technology	2,085	2,126	2,538	2,622	Cont	TBD
2002, Microwave Technology	4,303	4,388	5,238	5,412	Cont	TBD
2003, Avionics System Design Technology	3,840	3,916	4,674	4,829	Cont	TBD
2004 Reconnaissance/Strike Electro-Optical Sensors	1,369	1,396	1,666	1,722	Cont	TBD
4080 Ballistic Missile Avionics*	0	0	9,000	13,100	Cont	TBD
6095, Inertial Reference and Guidance Technology	1,434	1,462	1,746	1,804	Cont	TBD
6096, Microelectronics Technology	3,206	3,269	3,903	4,032	Cont	TBD
7622, Reconnaissance/Strike RF Sensors	2,131	2,173	2,594	2,680	Cont	TBD
7629, Fire Control Avionics	3,460	3,528	4,211	4,352	Cont	TBD
7633, Passive Electronic Countermeasures	2,548	2,598	3,102	3,205	Cont	TBD
7662, Avionics Data Transmission and Reception	967	986	1,177	1,216	Cont	TBD
Total	64,210	67,784	83,086	88,112	Cont	TBD

*This work transferred from PE 0603311F beginning in FY 1992.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program is the primary source of new concepts, feasibility demonstrations, and advanced technology for Air Force avionics system needs. It develops advanced avionics technology for target detection and classification, fire control, navigation, communication, jamming and deception of hostile defense, system architectures, signal/data processing electronic devices, and ICBM guidance systems. Advances in avionics are needed to multiply weapon system effectiveness, enhance reliability, and reduce life cycle costs.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06AA, Laboratory Operations: This project provides for the management and support of the Wright Laboratory's Avionics and Electronics Technology Directorates, Wright Patterson AFB OH. It includes civilian pay, travel, and utility costs.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

2. (U) Project 2000, Active Electronic Countermeasures: A formidable enemy air defense threat capability requires new electronic countermeasures that will degrade or deny detection and tracking of our aircraft. This project develops technology to jam, deceive, or disable hostile electronic threats throughout the electromagnetic spectrum.

(U) FY 1990 Accomplishments:
- (U) Tested non-adaptive cross polarization jamming technique offering a simple implementation of missile countermeasures.
- (U) Optimized jamming modulation against spread spectrum signals.

(U) FY 1991 Planned Program:
- (U) Study new high temperature superconductivity technology for electronic combat applications.
- (U) Evaluate several infrared flare configurations using a supersonic sled test facility.

(U) FY 1992 Planned Program:
- (U) Demonstrate approaches to counter laser trackers.
- (U) Evaluate several approaches to wideband multispectral decoys.
- (U) Test coherent jamming using digital signal memory circuits against pulse compression radars as basis for new Digital Frequency Radio Frequency Memories (DRFMs).
- (U) Integrate acoustic charge transport device into coherent memory jammer and evaluate improvements in signal purity.

(U) FY 1993 Planned Program:
- (U) Demonstrate infrared flare with radiation pattern tailored to resemble a combat aircraft.
- (U) Demonstrate DRFM in chip configuration for application to modern missile countermeasures.
- (U) Develop advanced software algorithms to produce real-time spatial and temporal control of jamming energy.

(U) Work Performed By: The five major contractors are: Lockheed Sanders Corp, Nashua N.H; Hughes Aircraft Co., El Segundo CA; ITT Corp., Nutley NJ; Harris Corp., Melbourne FL; and SRL Inc., Dayton OH. The program is managed by Wright Laboratory, Wright Patterson AFB OH.

(U) Related Activities:
- (U) Program Element 63270F, Electronic Combat Technology.
- (U) The Joint Director of Laboratories, Technology Panel On EW coordinates this program with the other services.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Work in this project is coordinated through subgroup Q of The Technology Coordinating Panel for UK, Canada, and Australia.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

3. (U) Project 2001, Electro-optical Technology: The Air Force needs to improve performance of electro-optical systems to increase engagement ranges and detect an increasingly complex variety of targets. This project develops low and medium power laser sources, optical pre-processing/image analysis technology, and detector/focal plane array technology for use in countermeasure, laser radar, imaging, warning and weapon delivery systems.

(U) FY 1990 Accomplishments:
- (U) Delivered non-cryogenic infrared (IR) detectors for imaging laser radar field test for target detection and ID.
- (U) Demonstrated semiconductor IC-compatible optical film waveguides for monolithic optical and electronic devices.

(U) FY 1991 Planned Program:
- (U) Initiate GaAs-based mid-IR detector development for better reliability and producibility of laser radar detectors.
- (U) Continue monolithic diode array pump effort for efficient flyable solid state lasers for IR countermeasures.
- (U) Build first very high speed optical processing arrays to improve target ID capabilities by factor of 1000.

(U) FY 1992 Planned Program:
- (U) Demonstrate first near to mid-IR rare earth semiconductor laser for more efficient, lower weight tactical laser systems.
- (U) Extend GaAs-based detector effort onto long wavelength IR to replace expensive, unreliable laser radar detector arrays.
- (U) Initiate optical interconnects program to maintain high computational performance with VHSIC-based systems.

(U) FY 1993 Planned Program:
- (U) Transition diode pumped mid-IR laser into IR countermeasures.
- (U) Initiate advanced ultraviolet passive detectors effort for detection of missile plume in background clutter.
- (U) Apply opto-electronic ICs to pixel level image processing.

(U) Work Performed By: Major contractors are: AT&T, Holmdel NJ,; Westinghouse, Pittsburgh PA; Lockheed-Sanders, Nashua NH; Honeywell, Minneapolis MN; and Hughes Aircraft, El Segundo CA. Managed by Wright Laboratory, Wright-Patterson AFB OH.

(U) Related Activities:
(U) DOD Advisory Group on Electron Devices coordinates this work.
(U) PE #0603203F, Advanced Avionics for Aerospace Vehicles.
(U) PE #0603270F, Electronic Combat Technology.
(U) There is no unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: TTCP Subgroup JP-10 and NATO Panel Group RSG-13 establish common efforts.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

4. (U) Project 2002, Microwave Technology: Develops RF component technology for Air Force use in electronic combat, tactical airborne radar, and communication systems. Emphasizes increased performance, reliability, size, weight and affordability. Areas of research include solid state and travelling wave tube (TWT) devices, monolithic integrated circuits (ICs), noise amplifiers, signal controls, transmit/receive (T/R) modules, and advanced apertures.

(U) FY 1990 Accomplishments:
- (U) Increased TWT power at 40-55 gigahertz (GHz) for airborne electronic countermeasures (ECM) self protection jammers.
- (U) Built higher efficiency tactical radar amplifier.

(U) FY 1991 Planned Program:
- (U) Develop economical TWT's for ECM self protection jammers.
- (U) Develop microwave high electron mobility transistor (HEMT) low noise amplifiers for tactical and surveillance radars.
- (U) Build combined microwave/digital ICs for smaller airborne fire control receivers.
- (U) Build high performance space communication amplifiers at 44 GHz using Indium Phosphide transistors

(U) FY 1992 Planned Program:
- (U) Transition new, high efficiency power amplifiers into tactical radar and ECM transmitters.
- (U) Develop small, tunable IC filters for tactical radars.
- (U) Develop high temperature (200 C)IC amplifiers for high reliability communication radar, and ECM systems.

(U) FY 1993 Planned Program:
- (U) Demonstrate high power output power transistors for airborne radar and electronic warfare phased array antennas.
- (U) Integrate microwave and optical ICs for high performance tactical and surveillance radars.
- (U) Develop integrated multifunction components (phase shifters, low noise amplifiers) for airborne radar/ECM systems.

(U) Work Performed By: Major contractors are: Hughes Aircraft, El Segundo CA; Texas Instruments, Dallas TX; Raytheon, Lexington MA; Rockwell International, Thousand Oaks CA; and TRW, Redondo Beach CA. Managed by Wright Laboratory, Wright-Patterson AFB OH.

(U) Related Activities:
(U) DOD Advisory Group on Electron Devices coordinates this work.
(U) PE #0603203F, Advanced Avionics for Aerospace Vehicles.
(U) PE #0603706E, Microwave/Millimeterwave Integrated Circuits.
(U) There is no unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

5. (U) Project 2003, Avionics System Design Technology: This project advances technology in avionics system architectures, signal and data processing hardware, sensor integration, real-time distributed software technology and machine intelligence to improve total weapon system performance. These capabilities will improve avionics availability, performance and crew situational awareness.

(U) FY 1990 Accomplishments:
- (U) Demonstrated first polysilicon liquid crystal display with integrated drivers.
- (U) Developed a breadboard high speed optical communications network for information distribution on aircraft.

(U) FY 1991 Planned Program:
- (U) Construct a neural network electronic warfare resource manager.
- (U) Study computer testability to determine constraints for fault tolerant avionics architectures.
- (U) Complete the study to determine architectures that optimize the use of wafer scale integration in avionics processors.

(U) Fy 1992 Planned Program:
- (U) Demonstrate drive reinforcement learning applied to robotics and adaptive flight control.
- (U) Develop specifications for neural network hardware implementation for avionics applications, such as automatic target recognizers, target tracking and improved RWR.
- (U) Complete design of a Common ADA Run Time System (CARTS).

(U) FY 1993 Planned Program:
- (U) Demonstrate multicrew 3 dimensional cockpit display concept.
- (U) Develop demonstration prototype reusable ADA software package.
- (U) Demonstrate a common ADA runtime system for two compilers.
- (U) Demonstrate the design of a near real-time data base management system for avionics.

(U) Work Performed By: The Wright Laboratory, Wright Patterson AFB OH manages this project. Contractors include: Wright State University, Dayton OH; Martin Marietta, Baltimore MD; Charles Stark Draper Laboratories, Boston MA; Booz Allen Hamilton, Arlington VA; and Westinghouse Electric Corp., Baltimore MD.

(U) Related Activities:
(U) PE 0603253F, Advanced Avionics Integration.
(U) PE 0602301E, Intelligence System Program.
(U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Coordination with the UK is accomplished through data exchange agreement IEP-UK-AF-17.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

6. (U) Project 2004, Reconnaissance/Strike Electro-Optical Sensors: This project develops technologies to improve performance, supportability, and cost of passive and active electro-optical (EO) sensor systems for reconnaissance and target acquisition. Advanced technology is required to improve target kill probability while maintaining low probability of detection by hostile forces.

(U) FY 1990 Accomplishments:
- (U) Developed performance models for next generation of forward looking infrared (FLIR) sensors.
- (U) Conducted comparative testing and analysis of platinum silicide versus mercury cadmium telluride imaging sensors.

(U) FY 1991 Planned program:
- (U) Complete development of variable parameter testbed FLIR to improve testing of FLIR components.
- (U) Test and evaluate the Army Standard Advanced IR Sensor (SAIRS) focal plane array against Air Force requirements.
- (U) Complete in-house assessment of laser radar sensor performance using electronically steered laser beams.

(U) FY 1992 Planned Program:
- (U) Test FLIR focal plane uniformity and sensitivity for use with automatic target recognizers.
- (U) Field test advanced imaging laser radars in varying weather and viewing conditions.

(U) FY 1993 Planned Program:
- (U) Test multispectral FLIRs to determine weather performance.
- (U) Utilizing the variable parameter FLIR evaluate the effects of advanced focal plane arrays on FLIR performance.
- (U) Develop laser radar performance models.

(U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB OH manages this project. The contractors include: Georgia Tech Research Institute, Atlanta GA; Environmental Research Institute of Michigan, Ann Arbor MI and Dayton OH; Battelle Laboratories, Columbus OH; The Analytical Sciences Corp., Reading MA; and Amber Engineering, Goleta CA.

(U) Related Activities:
(U) PE 0603203A, Aerospace Avionics.
(U) PE 0603737F, Strategic Relocatable Target Detection.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Memorandum of agreement with the German Ministry of Defense on data collection and exchange for Camouflage, Concealment and Deception Techniques.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

7. (U) Project 4080, Ballistic Missile Avionics: This is a new project to develop guidance technologies for ballistic missiles. Emphasis is on development of technologies supporting low cost, common component guidance sensor systems with high reliability and simplified maintenance procedures. This project also develops electronic devices for radiation hardened guidance applications.

(U) FY 1990 Accomplishments: (PE 0603311F)
- (U) Initiated effort for advanced accelerometers and guidance update concepts.

(U) FY 1991 Planned Program: (PE 0603311F)
- (U) Deliver two competing brassboard vibrating beam accelerometers (VBA) for lab test and evaluation.

(U) FY 1992 Planned Program:
- (U) Continue VBA development and perform radiation testing to determine environmental suitability.
- (U) Characterize radiation hardened guidance processor.
- (U) Develop integrated high accuracy digital accelerometers that improve weight and volume over stand-alone devices.
- (U) Develop high accuracy linear ICs for missile guidance applications.
- (U) Develop Gallium Arsenide Charge Injection Device (CID) to improve guidance signal readout capability.

(U) FY 1993 Planned Program:
- (U) Investigate emerging solid state inertial component technologies to meet low cost high reliability ICBM guidance requirements.
- (U) Evaluate GaAs charge injection device array for stellar update guidance application.
- (U) Evaluate results of VBA radiation testing.
- (U) Initiate development of monolithic high resolution analog-to-digital convertor.
- (U) Demonstrate chip-on-substrate packaging and interconnect technology to decrease guidance package volume requirements.
- (U) Apply GaAs CID focal plane array to Stellar update guidance application.

(U) Work Performed By: This project is managed by Wright Laboratory, Wright-Patterson AFB OH. Contractors include: Sunstrand Data Control Inc., Redmond WA; C.S. Draper Laboratories, Cambridge MA; and General Electric, Pittsfield MA.

(U) Related Activities:
(U) Program Element #0603311F, Advanced Strategic Missile Systems.
(U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International cooperative Agreements: Not Applicable.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

8. (U) Project 6095, Inertial Reference and Guidance Technology: Improvements in the accuracy of inertial navigation systems and sensors for aerospace vehicles will be needed to conduct precise strike and reconnaissance missions. This project will enhance both sensors and systems used for navigation. Combining antenna requirements for communication, navigation, identification (CNI) and electronic warfare (EW) is also in this project.

(U) FY 1990 Accomplishments:
- (U) Established the feasibility of combining CNI and EW functions from 2 MHz to 2 GHz reducing the quantity of antennas by 50%.
- (U) Completed development of a microchip laser source for inertial grade fiber optic gyros.
- (U) Through man-in-the-loop simulation, demonstrated new techniques for EO/radar sensor cuing.

(U) FY 1991 Planned Program:
- (U) Fabricate and evaluate an inertial grade fiber optic gyro to reduce navigation system costs.
- (U) Complete plasma shock effects work for hypervelocity navigation.
- (U) Develop a low cost velocity reference sensor for cruise missiles.

(U) FY 1992 Planned Program:
- (U) Demonstrate an accelerometer on a chip for low cost and high reliability.
- (U) Demonstrate automated fix-taking technologies to reduce crew workload.
- (U) Develop integrated inertial network concept for access to complete in-flight reference information.

(U) FY 1993 Planned Program:
- (U) Fabricate low cost velocity sensor for cruise missiles.
- (U) Demonstrate embedded multifunction antenna technology for hypervelocity vehicles.
- (U) Demonstrate through simulation, concept of integrated inertial mission effective flight reference information.

(U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB OH manages this project. The contractors include: Charles Stark Draper Laboratory, Cambridge MA; TRW, San Diego CA. McDonnell Douglas, St. Louis MO; Mayflower Communications Corp., Reading MA; TASC, Reading MA; and Sunstrand Data Control, Redmond WA.

(U) Related Activities:
(U) PE 0603253F, Advanced Avionics Integration
(U) There is no unnecessary duplication of effort within the Air Force or Department of Defense

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: None.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

9. (U) Project 6096, Microelectronics Technology: Develops the defense related integrated circuit technology base to meet the performance, reliability, maintainability and affordability requirements of future AF radar, weapon delivery, reconnaissance and electronic countermeasures subsystems. Work includes device development and application circuit design along with the associated packaging and power management technology to preserve device performance in electronic equipment.

(U) FY 1990 Accomplishments:
- (U) First successful integration of GaAs memory and logic devices for higher speed radar and ECM signal processing.
- (U) Demonstrated higher performance advanced analog-to-digital (A/D) converters for faster signal conditioning in ECM.

(U) FY 1991 Planned Program:
- (U) Demonstrate high speed, complex GaAs memories for higher resolution radar and improved electronic warfare systems.
- (U) Develop power conditioning device efforts for reliable, efficient power distribution to VHSIC/MMIC based systems.
- (U) Initiate very high performance digital signal processor packaging design for radar automatic target recognition.

(U) FY 1992 Planned Program:
- (U) Transition high performance A/D converter technology into tactical radar preprocessor and electronic countermeasures.
- (U) Demonstrate new logic approach with fewer devices per logic function for faster, more reliable digital processors.

(U) FY 1993 Planned Program:
- (U) Integrate high temperature electronics and microsensor technologies for engine controller applications.
- (U) Develop new, high performance conversion devices for distributed avionics power for increased reliability.
- (U) Demonstrate packaging for 10 times increased performance Radar Automatic Target Recognition processor.

(U) Work Performed By: Contractors are: AT&T, Murray Hill NJ; Rockwell, Thousand Oaks CA; Texas Instruments, Dallas TX; Honeywell, Minneapolis MN; and General Electric, Schnectady NY. Managed by Wright Laboratory, Wright-Patterson AFB OH.

(U) Related Activities:
(U) DOD Advisory Group on Electron Devices coordinates this work.
(U) PE #0603203F, Advanced Avionics for Aerospace Vehicles.
(U) PE #0602702F, Command Control and Communications
(U) There is no unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

10. (U) Project 7622, Reconnaissance/Strike RF Sensors: This project develops radar technology directly applicable to reconnaissance and strike mission applications. Emphasis is given to the development of techniques for reliable acquisition of surface and airborne targets with low observable and camouflaged signatures in severe background clutter, and heavy jamming environments.

(U) FY 1990 Accomplishments:
- (U) Completed radar receiver design for the AF/NASA Space Shuttle Imaging Radar bistatic surface targeting experiments.
- (U) Assessed jamming vulnerability assessment of high resolution synthetic aperture radar.

(U) FY 1991 Planned Program:
- (U) In conjunction with NASA, investigate SAR target signatures.
- (U) Investigate wide bandwidth adaptive waveform techniques for automatic detection of small mobile ground targets.

(U) FY 1992 Planned Program:
- (U) Perform bistatic experiment with European Space agencies ERS-1 Satellite for high resolution imaging.
- (U) Develop Moving Target Imaging algorithms and techniques for detecting moving targets in different clutter environments.
- (U) Demonstrate techniques to harden SAR against present and future jamming.

(U) FY 1993 Planned Program:
- (U) Perform Joint AF/NASA receiver experiments for bistatic imaging of surface targets.
- (U) Develop and test electronic counter-countermeasures (ECCM) algorithms to reduce UHR SAR susceptibility to ECM.
- (U) Flight test Moving Target and Autofocusing algorithms for detection of small moving targets in varying clutter.

(U) Work Performed BY: The Wright Laboratory, Wright-Patterson AFB OH manages this project. The contractors include: ERIM, Ann Arbor MI; Hughes El Segundo CA; Grumman, Bethpage NY; Ohio State University, Columbus OH; and Loral, Phoenix AR.

(U) Related Activities:
(U) PE 0603203F, Advanced Avionics for Aerospace Vehicles
(U) PE 0603253F, Advanced Avionics Integration
(U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Through the Technology cooperation Program, Australia and the UK will share responsibility for the Shuttle Imaging Radar (SIR-C) experiments.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

11. (U) Project 7629, Fire Control Avionics: Sensors for future air-to-air and surface strike missions rely on covert techniques to enhance survivability. This project develops fire control system concepts and technologies that aid in the location, identification and targeting of reduced signature, airborne and surface targets.

(U) FY 1990 Accomplishments:
- (U) Developed covert reconnaissance/strike targeting concepts for both manned and unmanned vehicles to identify and attack surface targets.
- (U) Defined conceptual covert air targeting systems to exploit improved sensors, multi-sensor integration, and aircraft internetting for enhanced situational awareness.

(U) FY 1991 Planned Program:
- (U) Investigate multiple hypothesis tracking to enhance search modes of tactical airborne radar.
- (U) Demonstrate multi-sensor Model Based Vision algorithm to aid air-to-ground target attack.

(U) FY 1992 Planned Program:
- (U) Complete preliminary design of advanced detection and tracking algorithms for tactical airborne radar.
- (U) Investigate multi-sensor fusion algorithms to improve air-to-ground tactical targeting.
- (U) Formulate real-time replanning system architecture for in-flight strike mission targeting changes.

(U) FY 1993 Planned Program:
- (U) Perform real-time operation of advanced detection and tracking algorithms using radar flight test data.
- (U) Evaluate real-time strike planning system architecture using laboratory simulation.
- (U) Validate model based vision air target models for automatic target recognizer algorithms.

(U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB OH manages this project. Contractors include: New York University, New York NY; Honeywell, Minneapolis MN; Frontier Technology, Santa Barbara CA; McDonnell Douglas, St Louis MO; Westinghouse, Baltimore MD.

(U) Related Activities:
(U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
(U) Tri-service coordination is accomplished through the Joint Services Guidance and Control Committee.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: None.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

12. (U) Project 7633, Passive Electronic Countermeasures: The objective of this project is to increase aircraft survivability by investigating and applying advanced technology to improve threat warning, reduce detectability, improve expendables, and to exploit foreign systems to reveal countermeasures vulnerabilities.

(U) FY 1990 Accomplishments:
- (U) Demonstrated spectrally agile focal plane infrared array to reduce false alarm rate for missile warning.
- (U) Flight evaluated two prototype laser warning receivers.

(U) FY 1991 Planned Program:
- (U) Enhance the Rapid Scanning Superheterodyne Receiver (RSSR) to automatically identify spread spectrum radars.
- (U) Demonstrate fiber-optic based laser warning receiver.

(U) FY 1992 Planned Program:
- (U) Demonstrate precision angle of arrival breadboard.
- (U) Demonstrate unique real-time high speed preprocessing on detector chip for infrared missile warning.
- (U) Demonstrate simplified, low cost limited capability tail warning system concept against a specific laser threat.

(U) FY 1993 Planned Program:
- (U) Develop compressive (microscan) receiver for high probability of intercept in a dense pulse environment.
- (U) Develop chaff-like dispensed devices to decoy coherent radar.
- (U) Develop Acousto-optic Dispersive Light Filter (AODLF) for band III laser threat detection.
- (U) Demonstrate an all digital Electronic Warfare receiver breadboard based on an in-house investment.

(U) Work Performed By:
(U) The Wright Laboratory at Wright-Patterson AFB OH manages this effort. The contractors include: Litton Applied Technology Division, Sunnyvale Ca; System Research Laboratory, Dayton Oh; Loral, Yonkers NY; Eaton AIL Division, Deer Park NY; and Honeywell, Minneapolis MN.

(U) Related Activities:
(U) Joint Director of Laboratories, Technology Program for Electronic Warfare, Tri-service Coordinating body.
(U) PE 0603270F, Electronic Combat Technology.
(U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Work is coordinated with Subgroup Q of the TTCP for UK, Canada, and Australia.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

13. (U) Project 7662, Avionics Data Transmission and Reception: This project addresses the growing need to transmit information to, from, and between aircraft with high integrity, low probability of intercept (LPI), and resistance to jamming and false transmission.

(U) FY 1990 Accomplishments:
- (U) Designed LPI/jam resistant (JR) adaptive communication system.
- (U) Demonstrated ultraviolet short range, non line-of-sight, LPI communications for use during Air Force Special Operations Command (AFSOC) refueling operations.

(U) FY 1991 Planned Program:
- (U) Demonstrate laser communications with holographic beam steering and an atomic filter for high signal to noise ratio.
- (U) Fabricate brassboard for jam resistant LPI transmission and reception of 16 KBPS data/voice.
- (U) Design optical intraflight data link for short range communications during clandestine AFSOC missions.

(U) FY 1992 Planned Program:
- (U) Demonstrate multiple beam multi-user optical communication.
- (U) Develop intraflight data link brassboard for AFSOC platforms.
- (U) Demonstrate adaptive LPI/JR communication and transition to Navy ATTD program for ARC-210 and Implementation into Integrated Communication Navigation Identification Avionics.

(U) FY 1993 Planned Program:
- (U) Initiate Integrated RF/Optical communication study.
- (U) Demonstrate AF/Navy featureless waveform immune to detection by standard intercept receivers.
- (U) Transition laser communication breadboard to advanced development.

(U) Work Performed By: The Wright Laboratory, Wright Patterson AFB OH manages this project. Major contractors are: Georgia Technical Research Institute, Atlanta GA; Electronic Decision Inc., Urbana IL; Martin Marietta, Denver CO; TRW, Dayton OH; and Environmental Research Institute of Michigan, Ann Arbor MI.

(U) Related Activities:
(U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
(U) PE 0603253F, Advanced Avionics Integration.
(U) These efforts are coordinated with Army (AVRADA) and Navy (NADC), NADC jointly funds the Adaptive LPI brassboard.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: This project is coordinated where feasible with the LPI subpanel of The Technology Coordinating Panel for UK, Canada and Australia.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602205F Budget Activity: #1 - Technology Base
PE Title: Personnel, Training, and Simulation

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
06HT Laboratory Support	11,288	12,655	12,186	12,574	Cont	TBD
1121 Training Development and Assessment Technology	2,442	2,621	3,004	3,528	Cont	TBD
1123 Aircrew Training Technology	7,929	7,924	8,250	8,980	Cont	TBD
1710 Logistics and Maintenance Technology	2,138	2,950	2,931	3,520	Cont	TBD
3017 Command and Control Training	1,172	1,072	1,464	1,654	Cont	TBD
7719 Force Acquisition & Distribution Systems	2,586	2,741	3,118	3,523	Cont	TBD
Total	27,555	29,963	30,953	33,779	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Research studies forecast that the Air Force will experience a decrease in the available manpower and level of education within the pool of eligible military recruits. These studies have been recognized within the AF and nation-wide, therefore this PE was identified for additional research to ensure a ready and able force. This Science and Technology program focuses on reducing the manpower requirements to operate and support weapon systems and on improving the effectiveness of the operators and maintainers. This program increases operational readiness by developing technologies to enable more effective classification, assignment, training, and retention of personnel; to minimize the manpower and equipment necessary to conduct maintenance; and to increase weapons systems supportability and improve wartime logistics planning.

C. (U) Program Accomplishments and Plans:

1. (U) Project 06HT, Laboratory Support: This project provides for the management, support, and operation of the Human Resources Directorate of the Armstrong Laboratory. The Directorate is located at Brooks AFB TX, Wright-Patterson AFB OH and Williams AFB AZ. It provides for the pay and related costs of civilian scientists, engineers, and support personnel; transportation of equipment; rents; communications and utilities costs; reproduction services; and procurement of supplies, equipment, and contractor support services for these facilities. Funds support and complement all projects in this PE. This is a continuing program.

2. (U) Project 1121, Training Development and Assessment Technology: The increased utilization of advanced technology, changes in the

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overall qualifications of the recruit pool, and budget constraints pose new challenges to the demanding task of training AF recruits. This project develops technology to accelerate learning, increase skill/knowledge retention, and improve job performance. Develops cost effective methods for designing, delivering, and evaluating skill specific training.

(U) FY 1990 Accomplishments:
- (U) Investigated machine learning and knowledge-based instructional planning to determine their utility for intelligent tutor development.
- (U) Developed performance-based methods to determine the match between current training programs and actual job requirements to improve training program development.

(U) FY 1991 Planned Program:
- (U) Develop guidelines to assist engineering, authoring, and selecting cost-effective and training efficient courseware for computer-based training.
- (U) Apply neural networks to train and control the student modeling component of intelligent tutors.
- (U) Determine the effectiveness of candidate instructional approaches in intelligent training systems to determine the most effective teaching methods.

(U) FY 1992 Planned Program:
- (U) Develop methods to identify core AF technical training needs to guide training planning and development.
- (U) Develop training evaluation information collection and feedback methods to assure training quality.
- (U) Study application of virtual realities technology to man-machine interface of intelligent tutoring systems.

(U) FY 1993 Planned Program:
- (U) Complete tutor technology demonstration for remediation of basic literacy skills required for job performance.
- (U) Develop procedures for defining fundamental job skills and providing remedial instructions to offset changes in recruit qualifications.
- (U) Develop methods to integrate training evaluation technologies into instruction design process to provide early and ongoing training quality feedback.

(U) Work Performed By: Work is performed and managed by the Armstrong Laboratory, Brooks AFB TX. The top contractors are: FMC Corp, Santa Clara CA; MEI Associates, Lexington MA; Harris Corp, Melbourne FL; Universal Energy Systems, Dayton OH; and McDonnell Douglas Corp., St. Louis MO.

(U) Related Activities:
(U) PE 0603227F, Personnel, Training, and Simulation Tech.

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(U) PE 0604243F, Manpower, Personnel, and Training Dev.
(U) PE 0602233N, Mission Support Technology: Personnel, Training and Simulation Technology Area.
(U) PE 0602785A, Manpower, Personnel, and Training Tech.
(U) AF has formal agreements with Army and Navy to share development of computer-based training technologies.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 1123, Aircrew Training Technology: Develops new methods and techniques for aircrew training. Investigates the entire spectrum of aircrew training to determine the best ways of designing, delivering and assessing ground based and aircraft training. Develops flight simulator component technologies to reduce the cost of future aircrew training systems, and to provide new capabilities for realistic combat training.

(U) FY 1990 Accomplishments:
- (U) Demonstrated a stand alone aircrew performance measurement system that can be added to existing training simulators.
- (U) Completed development of an artificial intelligence model of pilot knowledge structures to evaluate air combat decision-making strategies and develop improved training.
- (U) Defined simulator display requirements for combat training with respect to color, scene content, and field-of-view to optimize aircrew training simulator fidelity variables.

(U) FY 1991 Planned Program:
- (U) Develop a model incorporating visual training effectiveness data to optimize simulator fidelity variables for aircrew training and mission rehearsal.
- (U) Incorporate the addition of an air component to long-distance simulator networking to demonstrate simulator interconnection for a joint maneuver training exercise.
- (U) Explore methods for training cockpit attention and task management to reduce pilot overload in low altitude and other high task environments.

(U) FY 1992 Planned Program:
- (U) Develop a Visual System Design handbook to guide simulator visual system requirements development.
- (U) Develop visual display and image generator fidelity requirements to enable lower cost systems.
- (U) Develop training system guidelines to assist formal school training development.
- (U) Develop air-to-air multiship training guidelines for curriculum development.

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(U) FY 1993 Planned Program:
- (U) Develop training system evaluation guidelines to assist in contract training or government training selection.
- (U) Conduct a Joint-Service air-to-air network training demonstration to evaluate Joint-Service exercise value.
- (U) Develop aircrew training guidelines that will aid Special Operation Forces (SOF) training requirements development.

(U) Work Performed By: Program work is performed and managed by the Armstrong Laboratory, Williams AFB AZ. The top contractors are: University of Dayton, Dayton OH; Link Flight Simulation Corp., Binghamton NY; Logicon, San Diego CA; General Electric Corp., Daytona Beach FL; and Verac Corp., San Diego CA.

(U) Related Activities:
(U) PE 0603227F, Personnel, Training, and Simulation Tech.
(U) PE 0604227F, Flight Simulator Development.
(U) PE 0602233N, Mission Support Technology: Personnel, Training and Simulation Technology Area.
(U) PE 0602727A, Non-System Training Devices Technology.
(U) The AF has formal agreements with the Army for visual display and advanced computer image generation technology.
(U) The Navy has a liaison office at Armstrong Laboratory.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 1710, Logistics and Maintenance Technology: Conventional maintenance methods, practices, and procedures must be modernized to adequately support future complex weapon systems. This project develops new technologies to improve logistics support to both combat and peacetime operations. Develops improved logistics planning and assessment models for realistic computation of wartime logistics requirements and capabilities. Develops methods to identify tradeoffs to reduce the amount of manpower and equipment necessary to conduct aircraft maintenance in a dispersed location. Develops software tools enabling the design-in of improved reliability, maintainability, supportability, and man-machine interfaces to reduce life cycle costs.

(U) FY 1990 Accomplishments:
- (U) Developed combat-portable maintenance aids to provide capabilities for in-field training and estimating aircraft battle damage repair.
- (U) Developed computer-aided design graphics that allow estimation of maintainability and system operation in early design stages.

(U) FY 1991 Planned Program:
- (U) Develop computer-aided design tools to incorporate data on

Program Element: #0602205F Budget Activity: #1 - Technology Base
PE Title: Personnel, Training, and Simulation

human capabilities in space into design of new systems.
- (U) Develop advanced models to predict the impact of operational scenarios on combat logistics requirements.

(U) FY 1992 Planned Program:
- (U) Develop maintenance task time estimation database to minimize costs of manpower, personnel, and training (MPT) during the design process.
- (U) Develop a logistics simulation object database to improve information storage, retrieval, update, and display.

(U) FY 1993 Planned Program:
- (U) Develop logistics simulation model environment for use by logistics analysts at all component levels.
- (U) Develop a space-based maintenance technician man-model to improve the maintainability of future space systems.

(U) Work Performed By: Program work is performed and managed by the Armstrong Laboratory, Wright-Patterson AFB OH. The top contractors are: Applied Sciences Assoc., Valencia PA; Institute for Defense Analyses, McClean VA; Systems Exploration Inc., San Diego CA; and Systems Research Laboratory, Dayton OH.

(U) Related Activities:
(U) PE 0603106F, Logistics Systems Technology.
(U) PE 0602716A, Human Factors Engineering Technology Dev.
(U) PE 0602234N, Mission Support Technology: Human Factors Technology Area.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 3017, Command and Control Training. Combat readiness of personnel assigned to Tactical Command and Control (C2) systems is directly related to their ability to operate in a rapidly changing tactical environment. Inadequate emphasis on personnel training requirements and human factors considerations during the design and development phases often causes C2 system failure. This project develops methods for analyzing peacetime/wartime C2 job performance and training requirements, and develops new training and evaluation methods for complex C2 decision making and team performance.

(U) FY 1990 Accomplishments:
- (U) Developed models to define and replicate tactical battle staff decision-making skills for staff training.
- (U) Developed models to predict impact of C2 system automation on training requirements and team performance to preclude information overload/saturation.

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(U) FY 1991 Planned Program:
- (U) Develop an artificial intelligence-based embedded training program for Tactical Air Control Center training.
- (U) Develop improved training methods for individual and team battle management decision making to more efficiently conduct an air battle operation.

(U) FY 1992 Planned Program:
- (U) Develop advanced human performance process models capable of replicating human behavior to expedite effective decision-making in an information-isolated environment.
- (U) Develop artificial intelligence-based embedded training for Modular Control Element (MCE) teams that will support logistics, tactical, and space C2 training capabilities.

(U) FY 1993 Planned Program:
- (U) Demonstrate high performance skills part-task trainers for AF Space Command classroom training.
- (U) Develop operability test bed for integrated product development applications that allow for a wide variety of hardware/software combinations in systems development.

(U) Work Performed By: Program work is performed and managed by the Armstrong Laboratory, Wright Patterson AFB OH. The five major contractors are: BBN Laboratories, Cambridge MA; Logicon Inc., San Diego CA; University of Dayton, Dayton OH; Systems Research Laboratory, Dayton OH; and Systems Exploration, INC., San Diego CA.

(U) Related Activities:
(U) PE 0602702F, Command, Control, and Communication.
(U) PE 0603789F, C3I Technology Development.
(U) PE 0602233N, Mission Support Technology: Personnel, Training and Simulation Technology Area.
(U) PE 0602785A, Manpower, Personnel, and Training Technology.
(U) Armstrong Laboratory has formal agreements with the Rome Laboratory to share C2 systems research products.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 7719, Force Acquisition and Distribution Systems: This project develops personnel qualification and aptitude measurement methods, job specification standards, and manpower and personnel models to provide methods and tools for optimal selection, classification, and assignment of personnel.

(U) FY 1990 Accomplishments:
- (U) Developed and field tested the Leadership Effectiveness

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Assessment Profile (LEAP) to enable selection and classification based on AF leadership potential.
- (U) Completed a model to estimate the supply of civilians interested in and qualified for military service.
- (U) Developed top-level cognitive analysis methods for basic job skills (BJS) to determine skill commonalities across jobs for job family tutor development.

(U) FY 1991 Planned Program:
- (U) Deliver pilot selection models to improve trainee quality.
- (U) Deliver pilot classification model to improve bomber/fighter and tanker/transport classification decisions.
- (U) Deliver second generation cognitive task analysis methods that specify unobservable problem solving skills required in troubleshooting tasks.

(U) FY 1992 Planned Program:
- (U) Begin development of advanced transferability skills models for manpower, personnel, and training application.
- (U) Deliver optimal personnel retraining decision guidelines.
- (U) Deliver Processing and Classification of Enlistees-Person Job Match (PACE-PJM) System to Air Training Command for optimal classification of trainees to jobs.

(U) FY 1993 Planned Program:
- (U) Deliver Assignment-Level Person Job Match capability to the AF Military Personnel Center for AF assignment system integration.
- (U) Deliver initial neural network models for enhancing enlisted and officer force management.
- (U) Complete guidelines for implementation of cognitive task analysis technology in developing troubleshooting tutors.

(U) Work Performed By: Program work is performed and managed by the Armstrong Laboratory, Brooks AFB TX. The two contractors are: Metrica Inc., Bryan TX; and Operational Technologies Corp., San Antonio TX.

(U) Related Activities:
(U) PE 0603227F, Personnel, Training, and Simulation Tech.
(U) PE 0604243F, Manpower, Personnel, and Training Development.
(U) PE 0602233N, Mission Support Technology: Personnel, Training and Simulation Technology Area.
(U) PE 0602785A, Manpower, Personnel, and Training Technology.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602206F Budget Activity: 1-Technology Base
PE Title: Civil Engineering & Environmental Quality

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
1900 Environmental Quality Technology	2,961	3,098	2,986	3,605	Cont	TBD
2673 Civil Engineering Technology	3,513	3,859	3,758	4,014	Cont	TBD
Total	6,474	6,957	6,744	7,619	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology exploratory development program develops technology for civil engineering and environmental requirements in deploying, operating, and maintaining Air Force weapon systems. This goal is achieved in the following areas: protective construction of air base facilities, utilities, and operating surfaces against conventional and chemical/biological attacks; air mobile structures; rapid air base battle damage assessment and repair; cost-effective maintenance and repair of air base facilities, utilities and operating surfaces; peacetime and post-attack air base and aircraft fire suppression/crash rescue; control, detection, and disposal of pollutants from Air Force operations; reduction of hazardous waste generation at air bases; and remedial actions for Air Force site cleanup.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

1. (U) Project 1900, Environmental Quality Technology: This project characterizes the chemistry of Air Force-generated pollutants and toxic materials, assesses their interaction with the environment, and develops control and clean-up technologies. Research is conducted to reduce the cost and increase the effectiveness of technologies that protect the environment. New Air Force fuels and chemicals, such as jet engine and rocket fuels, are monitored to anticipate and prevent environmental problems from occurring and to prevent delays in testing and fielding weapon systems. Materials are investigated and new processes explored to minimize hazardous waste generation. Installation restoration technologies are also explored.

(U) FY 1990 Accomplishments:
- (U) Investigated toxic waste reduction from aircraft electroplating.
- (U) Developed analytical procedures to identify source of fuel spills to determine cleanup responsibility.

(U) FY 1991 Planned Program:
- (U) Investigate nitrogen oxide formation/control in engine test cells and environmental compliance to avoid shutdown.
- (U) Develop nontoxic corrosion inhibitors for primer coatings; eliminates hazardous waste generation during repainting.

Program Element: #0602206F Budget Activity: 1-Technology Base
PE Title: Civil Engineering & Environmental Quality

(U) FY 1992 Planned Program:
- (U) Investigate atmospheric impacts of volatile organic chemicals from AF industrial operations.
- (U) Develop cryogenic removal technology to extract solid rocket propellant for disposal; reduces hazardous waste.
- (U) Develop control technologies for volatile organic chemical emissions from AF industrial operations.

(U) FY 1993 Planned Program:
- (U) Identify processes to treat combined waste streams for USAF industrial processes.
- (U) Develop environmentally safe techniques to destruct or recycle decommissioned solid rocket propellant.

(U) Work Performed By: AF Engineering and Services Lab, Tyndall AFB FL manages this project. Top contractors: U. of Calif., Irvine CA; EG&G, Idaho Falls ID; 3M Corporation, St. Paul MN; Martin Marietta, Oak Ridge TN; and ASI, Albuquerque NM.

(U) Related Activities:
(U) PE #0601102F, Defense Research Sciences.
(U) PE #0602102F, Materials.
(U) PE #0602202F, Human Systems Technology.
(U) PE #0602203F, Aerospace Propulsion.
(U) PE #0603211F, Aerospace Structures.
(U) PE #0603723F, Civil and Environmental Engineering Technology.
(U) No unnecessary duplication of effort within the USAF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2673, Civil Engineering Technology: This project provides the technology base for current and future Air Force systems in the following areas: survivable air base structures, utilities, and operating surfaces against more accurate and powerful conventional and chemical/biological weapons; air base battle damage assessment and repair; air mobile structures; and cost-effective maintenance and repair of air base facilities, utilities, and operating surfaces. DoD has designated the Air Force as the lead service for air base/aircraft crash rescue and fire suppression.

(U) FY 1990 Accomplishments:
- (U) Studied bonding process for concrete construction materials to increase air base facility strength and durability.
- (U) Researched dynamic material properties to economically construct buried air base protective structures.
- (U) Determined feasibility of using vibration to reduce upheaval formed around airfield bomb craters--reduce repair time by one-half.
- (U) Completed 3-D survivability assessment computer code to evaluate protective structures.

(U) FY 1991 Planned Program:
- (U) Develop reliable, high temperature resistant pavement design

Program Element: #0602206F Budget Activity: 1-Technology Base
PE Title: Civil Engineering & Environmental Quality

for short takeoff and landing aircraft.
- (U) Evaluate the use of inorganic and expedient repair materials to support post-attack runway repair.
- (U) Develop operational halon firefighting replacement agent; environmentally safe, and reduces ozone depletion and global warming potentials.
- (U) Develop models and data base for dynamic response of reinforced soil systems.

(U) FY 1992 Planned Program:
- (U) Investigate design concepts for reactive armor for hardened structures.
- (U) Design concepts for lightweight, efficient electrical systems for rapid deployment.
- (U) Determine vulnerability of critical facilities to high power microwaves.

(U) FY 1993 Planned Program:
- (U) Develop design concepts for air mobile utility systems for force projection; sustains air base operations in combat.
- (U) Evaluate advanced adhesive materials for use in construction of air mobile shelters.

(U) Work Performed By: AF Engineering and Services Lab, Tyndall AFB FL manages this project. Top contractors: New Mexico Engineering Research Institute, Albuquerque NM; Applied Research Associates, Albuquerque NM; U. of Florida, Panama City FL; Texas A&M, College Station TX; and Resource International, Westerville OH.

(U) Related Activities:
(U) PE #0601102F, Defense Research Sciences.
(U) PE #0602102F, Materials.
(U) PE #0602202F, Human Systems Technology.
(U) PE #0602203F, Aerospace Propulsion.
(U) PE #0603211F, Aerospace Structures.
(U) PE #0603231F, Crew Systems and Personnel Protection.
(U) PE #0603307F, Air Base Operability Advanced Development.
(U) PE #0603723F, Civil and Environmental Engineering.
(U) No unnecessary duplication of effort within the USAF or DoD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602302F Budget Activity: #1 - Technology Base
PE Title: Rocket Propulsion and Astronautics Technology

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
06RL Laboratory Operations	13,390	14,200	14,796	15,418	Cont	TBD
2864 Space Vehicles Technology	3,490	7,139	9,714	11,016	Cont	TBD
3058 Space Systems Propulsion Technology	7,145	8,973	10,696	11,610	Cont	TBD
3059 Missile Systems Propulsion Technology	1,570	6,919	12,135	14,813	Cont	TBD
3148 Air-Launched Missile Propulsion Technology*	2,055	0	0	0	Cont	TBD
5730 Fundamental Technologies**	8,586	0	0	0	Cont	TBD
Total	36,236	37,231	47,341	52,857	Cont	TBD

Notes: * Project 3148 content and funding was merged with Project 3059. There are no changes in program scope, content, or total funding.
** Project 5730 content and funding was merged into Projects 2864, 3058, and 3059. There are no changes in program scope, content, or total funding.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program provides the Air Force rocket propulsion and astronautics technology base. Rocket propulsion technology is developed to increase the performance, reliability, and cost effectiveness of tactical and strategic missiles and space systems. Astronautics technology is developed to enhance the performance, survivability, and operational flexibility of space vehicle systems while reducing system cost. This program accomplishes small scale laboratory tests proving feasibility and potential payoffs of new technologies before starting large-scale demonstrations in Space and Missile Rocket Propulsion (PE 0603302F) and Advanced Spacecraft Technology (PE 0603401F). Starting in FY92, research is expanding in projects 2864 and 3059 in support of Space Systems Technology (PE 0603428F) and Ballistic Missile Technology (PE 0603311F) respectively. The most promising rocket propulsion and space vehicle technologies are selected for further demonstration in these four advanced technology development programs based on operational requirements and the need to exploit technological opportunities. This program also provides for the management and in-house operation of the Phillips Laboratory Directorates (AFSC), Edwards AFB CA. This Air Force program complements related science and technology development conducted by the other Services and NASA. It supports the critical signature control and high energy density materials (HEDM) technology development efforts identified in the 1991 Defense Critical Technologies Plan.

Program Element: #0602302F Budget Activity: #1 - Technology Base
PE Title: Rocket Propulsion and Astronautics Technology

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06RL, Laboratory Operations: This project provides for the management, support, and operation of the Propulsion and Spacecraft Technologies Directorates of Phillips Laboratory, Edwards AFB CA. It provides for the pay and related costs of civilian scientists, engineers, and support personnel; transportation of equipment; rents; communications and utilities costs; reproduction services; and procurement of supplies, equipment, and contractor support services for these facilities. Funds support and complements all projects in this PE. This is a continuing program.

2. (U) Project 2864, Space Vehicles Technology: This project develops and integrates technology for advanced spacecraft structural design and control, thermal management, vehicle health monitoring, material applications, space power, space vehicle sciences, and spacecraft operations. This technology increases the performance, enhances survivability and operational flexibility, and reduces the weight and life-cycle costs of Air Force space vehicle systems.

(U) FY 1990 Accomplishments:
- (U) Fabricated composite structural components with embedded sensors/actuators for subscale, active vibration damping and control testing.
- (U) Verified computer analysis codes which define structural vibration control requirements for large space structures.
- (U) Established world-class research experimental facility for testing the dynamics of large precision space structures.

(U) FY 1991 Planned Program:
- (U) Complete subscale testing of space structures to evaluate feasibility of active vibration control technique.
- (U) Design advanced carbon-carbon composite radiator which allows increased spacecraft power and reduces weight.
- (U) Demonstrate the feasibility of manufacturing lightweight composite payload shrouds with subscale hardware.

(U) FY 1992 Planned Program:
- (U) Conduct system-level tests of smart space structures to verify active vibration control techniques for large space structures such as surveillance sensor platforms.
- (U) Begin designing a low cost space experiment to validate advanced structures, materials, and control technologies.
- (U) Initiate the design and analysis of composite spacecraft joints to reduce weight by 50 percent over metallic joints.
- (U) Manufacture a lightweight composite payload shroud capable of providing major payload increases for Delta class boosters.

(U) FY 1993 Planned Program:
- (U) Demonstrate ability to apply uniform metal coatings to sub-scale cryogenic tanks to reduce inert weight by 30 percent.

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PE Title: Rocket Propulsion and Astronautics Technology

- (U) Identify and conduct high payoff demonstration/validation ground article testing which would integrate surveillance sensor systems in support of space subsystem technologies.
- (U) Demonstrate composite radiator concept with potential to reduce spacecraft radiator weight by 30 percent.

(U) Work Performed By: This project is managed by the Phillips Laboratory (AFSC), Edwards AFB CA. The top five contractors are Harris Corporation, Melbourne FL; McDonnell Douglas Space Systems, Huntington Beach CA; Boeing Aerospace, Seattle WA; Martin Marietta Astronautics, Denver CO; and TRW, Redondo Beach CA.

(U) Related Activities:
(U) PE 0602203F, Aerospace Propulsion.
(U) PE 0603401F, Advanced Spacecraft Technology.
(U) PE 0603402F, Space Test Program.
(U) PE 0603428F, Space Subsystems Technology.
(U) Coordination accomplished through the Air Force/NASA Space Technology Interdependency Group and an Astronautics Laboratory/NASA Langley Research Center MOU on space systems research and technology development.
(U) There is no unnecessary duplication of effort within the Air Force, NASA, or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3058, Space Propulsion Technology: This project advances rocket propulsion technology options for future Air Force space systems, including spacecraft, orbit transfer vehicles, and launch vehicles. This technology increases propulsion system performance and reliability, supports both launch-on-demand and launch-on-schedule operations, and reduces space launch and orbit transfer costs. Areas of investigation include storable and cryogenic liquid, electric, and solar/thermal propulsion systems.

(U) FY 1990 Accomplishments:
- (U) Fabricated porous disk (solar propulsion) thruster with twice the performance of chemical propulsion thrusters.
- (U) Verified altitude-compensating nozzle for optimizing launch vehicle performance over entire ascent trajectory.
- (U) Initiated effort to determine feasibility of using current high energy density material (HEDM) propellant candidates in space and missile propulsion systems to dramatically increase mission capabilities.

(U) FY 1991 Planned Program:
- (U) Scale-up HEDM propellant candidates and demonstrate 25 percent increase in performance over current propellants.
- (U) Evaluate feasibility of diamond film coatings to increase

Program Element: #0602302F Budget Activity: #1 - Technology Base
PE Title: Rocket Propulsion and Astronautics Technology

life of liquid engine turbopump bearings by 300 percent.
- (U) Develop low cost, high performance nozzle to increase cryogenic liquid engine performance by 15 percent.

(U) FY 1992 Planned Program:
- (U) Evaluate feasibility of liquid crystal polymers to increase performance and reliability of liquid engine nozzles.
- (U) Develop subscale inflatable solar concentrator required for high performance solar/thermal propulsion concepts.
- (U) Conduct subscale tests to improve efficiency of magneto-plasmadynamic (electric propulsion) thrusters to enable 100 to 350 percent performance increase over chemical systems.

(U) FY 1993 Planned Program:
- (U) Conduct test firings to demonstrate 10-fold increase in combustion chamber durability for space launch propulsion.
- (U) Evaluate capability of composite materials to reduce upper stage rocket engine weight by 50 percent.
- (U) Integrate porous disk thruster with inflatable concentrator and demonstrate potential for 200 percent increase in orbit transfer vehicle payload capability using solar propulsion.

(U) Work Performed By: This project is managed by the Phillips Laboratory (AFSC), Edwards AFB CA. The top five contractors are Aerojet Propulsion, Sacramento CA; Atlantic Research, Gainesville VA; McDonnell Douglas Astronautics, St Louis MO; Rockwell International/Rocketdyne, Canoga Park CA; and United Technologies/Pratt & Whitney, West Palm Beach FL.

(U) Related Activities:
(U) PE 0603302F, Space and Missile Rocket Propulsion.
(U) PE 0603401F, Advanced Spacecraft Technology.
(U) PE 0603402F, Space Test Program.
(U) Coordination accomplished through the Joint Army-Navy-NASA-Air Force Interagency Propulsion Committee and the Air Force/NASA Space Technology Interdependency Group.
(U) There is no unnecessary duplication of effort within the Air Force, NASA, or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 3059, Missile Systems Propulsion Technology: This project develops advanced rocket propulsion technology for tactical and strategic missile systems. This technology enables new warfighting capabilities, enhances weapon system survivability and operational flexibility, and reduces life-cycle costs of fielded weapons.

(U) FY 1990 Accomplishments:
- (U) Measured electrical properties of ICBM propellants to

Program Element: #0602302F Budget Activity: #1 - Technology Base
PE Title: Rocket Propulsion and Astronautics Technology

characterize susceptibility to electrostatic discharge.
- (U) Developed "insuliner" to improve reliability of propellant and insulation interface and reduce rocket motor failures.

(U) FY 1991 Planned Program:
- (U) Investigate damage response of composite motor cases and develop methods for repairing air-launched missiles.
- (U) Assess ability of computed tomography non-destructive evaluation technique to predict service life of missiles.

(U) FY 1992 Planned Program:
- (U) Identify and characterize environmentally safe solid rocket propellants for space boosters and ballistic missiles.
- (U) Develop composite motor cases using liquid crystal polymers to reduce weight of rocket motor cases by 30 percent.
- (U) Demonstrate ballistic missile technologies, including high energy propellants, conical composite cases, and two stage ICBMs to reduce life-cycle costs by 25 percent.
- (U) Conduct hot firings of high energy density propellant candidates in subscale thrusters to demonstrate 25 percent increase in rocket motor performance.

(U) FY 1993 Planned Program:
- (U) Complete research leading to military reuse of ammonium perchlorate eliminating need for hazardous waste disposal.
- (U) Establish U.S. capability to fabricate carbon-carbon nozzles and exit cones to end reliance on foreign sources.
- (U) Analyze and test five new polymers for use in lightweight missile skirts and fairings for ballistic missiles.

(U) Work Performed By: This project is managed by the Phillips Laboratory (AFSC), Edwards AFB CA. The top five contractors are Aerojet Propulsion, Sacramento CA; Atlantic Research, Gainesville VA; Hercules Aerospace, Salt Lake City UT; Thiokol, Brigham City UT; and United Technologies/Chemical Systems, San Jose CA.

(U) Related Activities:
- (U) PE 0602111N, Anti-Air/Anti-Surface Warfare.
- (U) PE 0602303A, Missile Technology.
- (U) PE 0602602F, Conventional Munitions.
- (U) PE 0603302F, Space and Missile Rocket Propulsion.
- (U) PE 0603311F, Ballistic Missile Technology.
- (U) Coordination accomplished through the Joint Army-Navy-NASA-Air Force Interagency Propulsion Committee and the Joint Tactical Air-to-Air Missile Office.
- (U) There is no unnecessary duplication of effort within the Air Force, NASA, or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602601F Budget Activity: #1-Technology Base
PE Title: Advanced Weapons

A. (U) Resources ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
06WL Lab Operations	19,822	19,858	22,288	23,539	Cont	TBD
2007 Nuclear Safety	291	-0-	-0-	-0-	Cont	TBD
2218 Directed Energy Weapon Technology Assessment	1,539	1,813	1,904	1,874	Cont	TBD
3326 Lasers and Imaging	4,239	6,847	6,629	6,817	Cont	TBD
5797 High Power Technologies	4,710	6,387	6,629	6,816	Cont	TBD
8809 Nuclear Survivability & Hardness Technology	1,039	967	1,000	1,000	Cont	TBD
Total	31,640	35,872	38,450	40,046	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This effort advances the state of the art in technologies associated with directed energy weapons (DEWs) such as high energy lasers (HELs), high power microwave (HPM) weapons, and plasmas and their effects. Also pursued are advanced optics technologies including imaging and nonlinear optical devices. Management and support of the Lasers and Imaging Directorate and the Advanced Weapons and Survivability Directorate of the Phillips Laboratory at Kirtland Air Force Base, NM, is also included.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06WL, Lab Operations: This project supports all other projects in this program element and provides for management, support, and operation of the Lasers and Imaging Directorate and the Advanced Weapons and Survivability Directorate of the Phillips Laboratory, Kirtland AFB, NM. It provides for the pay and related costs of civilian scientists, engineers, and support personnel; transportation of equipment, rents, communications and utilities costs; reproduction services, procurement of supplies and equipment; and contractor support services for maintenance and modification of facilities. The cost growth following FY 1991 reflects the conversion of a number of military positions to civilian.

2. (U) Project 2218, Directed Energy Weapon (DEW) Technology Assessment: This project assesses vulnerability of US strategic and tactical systems to DEWs, operational utility of DEWs for specific Air Force missions, and DEW lethality against foreign targets.

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PE Title: Advanced Weapons

(U) FY 1990 Accomplishments:
- (U) Performed laser susceptibility tests on satellite subsystems.
- (U) Tested satellite materials for susceptibility to repetitively pulsed lasers.
- (U) Performed high power microwave (HPM) susceptibility analysis on selected tactical systems.
- (U) Prepared space experiment laboratory for vacuum testing.
- (U) Initiated evaluations of advanced power conversion for nuclear power applications.
- (U) Completed studies for ground based laser (GBL) system optimization and technology feasibility.
- (U) Evaluated tactical laser for access denial system to protect high value target locations.

(U) FY 1991 Planned Program:
- (U) Perform lethality assessments for GBL antisatellite (ASAT) candidates.
- (U) Update laser lethality calculations to include detailed modeling of acquisition, tracking, and pointing functions.
- (U) Evaluate tactical HPM and laser technology transition opportunities (coordinated effort with other services and national laboratories).
- (U) Perform HPM susceptibility analyses on tactical systems.
- (U) Deliver simulated imagery for analysis at AF Space Command.
- (U) Publish first formal vulnerability assessment by the in-house Satellite Assessment Center.

(U) FY 1992 Planned Program:
- (U) Integrate fire control and damage assessment models into satellite lethality calculations for realistic evaluations of GBL ASAT options.
- (U) Investigate low to moderate power laser for weapon applications exploiting current and future technologies.
- (U) Consolidate and update laser vulnerability and effects data base on advanced tactical missiles.
- (U) Complete simulations and integrate field data into advanced imaging analyses for GBL ASAT applications.
- (U) Develop tactical infrared missile threat system response models.

(U) FY 1993 Planned Program:
- (U) Evaluate through experiment and analysis the vulnerability of critical subsystems in advanced tactical missile threats.
- (U) Complete HPM vulnerability assessment of tactical systems using actual effects test data.
- (U) Develop directed energy advanced technology transition demonstration.

(U) Work Performed By: The Advanced Weapons and Survivability Directorate of the Phillips Laboratory, Kirtland Air Force Base, NM performs in-house research and manages this program. The top five contractors are: R&D Associates, Los Angeles, CA; Science and Engineering Associates, Albuquerque, NM; Kaman Sciences Corporation,

Program Element: #0602601F Budget Activity: #1-Technology Base
PE Title: Advanced Weapons

Albuquerque, NM; PDI Technologies, Inc, Brea, CA; and Orion International Technology, Inc, Albuquerque, NM.

(U) Related Activities:
(U) PE 0602204F, Aerospace Avionics
(U) PE 0603605F, Advanced Weapons Technology
(U) PE 0603217C, Follow-on Systems
(U) PE 0603314A, High Energy Laser & Directed Energy Components
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3326, Lasers and Imaging: This project examines the technical feasibility of lasers as weapons for AF mission requirements. This includes advanced short wavelength laser devices for several applications including use as illuminators/imaging sources; imaging techniques for aimpoint selection, maintenance, and damage assessment; and nonlinear optics (NLO) processes and techniques.

(U) FY 1990 Accomplishments:
- (U) Validated an advanced active imaging algorithm.
- (U) Performed experiments for multiple telescope passive imaging.
- (U) Preliminary demonstration of an advanced chemical laser.

(U) FY 1991 Planned Program:
- (U) Complete sensor development for high resolution passive imaging.
- (U) Demonstrate holographic passive imaging in laboratory.
- (U) Evaluate optical mirror coatings under high intensity.

(U) FY 1992 Planned Program:
- (U) Demonstrate advanced image enhancement using NLO for space object identification.
- (U) Demonstrate motion detection using NLO and novel filter development for uncooperative target identification and tracking.
- (U) Demonstrate coupling of lasers using a fiber NLO crystal.
- (U) Evaluate xenon laser suitability for tactical applications.
- (U) Complete development of smaller advanced oxygen generators for chemical laser applications.

(U) FY 1993 Planned Program:
- (U) Complete a passive imaging fast algorithm development for uncooperative space object identification.
- (U) Perform holography demonstration on 3.5 meter telescope.
- (U) Develop NLO thin films deposition technology.
- (U) Demonstrate 5 kilowatt xenon laser for tactical applications.

Program Element: #0602601F Budget Activity: #1-Technology Base
PE Title: Advanced Weapons

(U) Work Performed By: The Lasers and Imaging Directorate of the Phillips Laboratory, Kirtland Air Force Base, NM performs major in-house research and manages this program. The top five contractors are: R&D Associates, Los Angeles, CA; S Systems Corp, Inglewood, CA; BDM-MCLEAN, VA; Rockwell Power Services, Albuquerque, NM; and Applied Technologies, Albuquerque, NM.

(U) Related Activities:
(U) PE 0602101N, Directed Energy Weapons
(U) PE 0602307A, Laser Weapon Technology
(U) PE 0603217C, Follow-on Systems
(U) PE 0603314A, High Energy Laser & Directed Energy Components
(U) PE 0603605F, Advanced Weapons Technology
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 5797, High Power Weapons: This project explores nonconventional weapons concepts using innovative technologies. Primary areas of research are high power microwave (HPM) technology, high energy plasmas such as compact toroids, and high energy pulse power.

(U) FY 1990 Accomplishments:
- (U) Completed narrow bandwidth HPM tests against an F-16 Flight Control System, PAVE PAWS radar module, AGM-65 missile, and electro-explosive devices and completed wide bandwidth tests against F-16 Analog Flight Control System, PAVE PAWS, and AGM-65.
- (U) Formed 200-300 kilojoule compact toroids.
- (U) Produced HPM energy 8x greater than previous capability.
- (U) Designed, simulated high efficiency several kilojoule, several gigawatt, 3 gigahertz HPM source.

(U) FY 1991 Planned Program:
- (U) Develop high energy phased array HPM device technology.
- (U) Evaluate disruption capability of HPM on subsystems such as F-16 Digital Flight Control System, Air Launched Cruise Missile altimeter, and electro-explosive devices.
- (U) Form and accelerate megajoule class compact plasma toroids.
- (U) Develop high power, long pulse, tunable HPM source using backward wave oscillator (BWO) technology.

(U) FY 1992 Planned Program:
- (U) Complete HPM weapons analysis and model development to determine the potential for weaponization.
- (U) Form and accelerate compact plasma torroids up to 4 megajoules.

Program Element: #0602601F Budget Activity: #1-Technology Base
PE Title: Advanced Weapons

- (U) Produce 1 kilojoule of energy from a single high power microwave (HPM) tube for transition to first generation HPM weapon development.
- (U) Complete HPM tests on integrated circuits and semiconductor chips.

(U) FY 1993 Planned Program:
- (U) Conduct multi-megajoule compact toroid application experiments to support advanced development decision.
- (U) Validate HPM coupling codes on US and foreign systems to allow reliable predictions for untestable systems.
- (U) Demonstrate 1 kilojoule per pulse in x-band using a backward wave oscillator to exploit target vulnerabilities in this band.

(U) Work Performed By: The Advanced Weapons and Survivability Directorate of the Phillips Laboratory, Kirtland Air Force Base, NM conducts major in-house research and manages this program. The top five contractors are: Maxwell Laboratories, Inc, San Diego, CA; R&D Associates, Los Angeles, CA; Rockwell Rocketdyne, Canoga Park, CA; Kaman Sciences Corporation, Albuquerque, NM; Mission Research Corporation, Albuquerque, NM.

(U) Related Activities:
(U) PE 0602120A, Electronic Survivability & Fuzing Technology
(U) PE 0602101N, Directed Energy Weapons
(U) PE 0602202F, Human Systems Technology
(U) PE 0602204F, Aerospace Avionics
(U) PE 0603605F, Advanced Weapons Technology
(U) PE 0603743F, Electronic Combat Technology
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 8809, Survivability/Vulnerability Technology: This project develops survivability/vulnerability technology for AF aerospace systems. This includes design criteria, specifications, standards and design handbooks, and methods for enhancing the survivability of spacecraft against hostile environments created by directed energy and nuclear weapons. Techniques will be developed to harden microelectronics against space and nuclear radiation effects.

(U) FY 1990 Accomplishments:
- (U) Discovered the phenomenon of low temperature annealing to negate radiation damage in infrared detectors.
- (U) Computer model development for multiple blast and shock damage to missile silos.

Program Element: #0602601F Budget Activity: #1-Technology Base
PE Title: Advanced Weapons

(U) FY 1991 Planned Program:
- (U) Complete space radiation evaluation on fiber optic sample.
- (U) Complete study of radiation hardness of cryogenic circuits.
- (U) Complete weapon output studies on Soviet missiles.

(U) FY 1992 Planned Program:
- (U) Develop advanced nuclear weapon models to determine prompt radiation at high altitudes for space systems.
- (U) Evaluate high temperature superconductors for space.
- (U) Implement multi-burst nuclear phenomenology computer code.

(U) FY 1993 Planned Program:
- (U) Complete sensor protection studies for space system components.
- (U) Characterize nuclear space debris effects on composite materials.
- (U) Complete test, analysis of three dimensional wafer scale central processing unit.

(U) Work Performed By: The Advanced Weapons and Survivability Directorate of the Phillips Laboratory, Kirtland Air Force Base, NM performs in-house research and manages this program. Contractors are: R&D Associates, Los Angeles, CA; Mission Research Corp, Santa Barbara, CA; and University of New Mexico, Albuquerque, NM.

(U) Related Activities:
(U) PE 0602715H, Defense Nuclear Agency
(U) PE 0603311F, Advanced Strategic Missile Systems
(U) PE 0603605F, Advanced Weapons Technology
(U) PE 0604711F, Air Force Systems Survivability
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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Program Element: #0602602F Budget Activity: #1 - Technology Base
PE Title: Conventional Munitions

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
06AL Armament Directorate Operations	14,041	14,194	15,331	15,729	Cont	TBD
2068 Advanced Guidance Technology	11,941	11,316	11,600	11,050	Cont	TBD
2502 Ordnance Technology	9,739	9,091	7,708	7,500	Cont	TBD
2543 Weapons Effectiveness Methodology	1,631	1,546	1,725	1,698	Cont	TBD
2567 Aeromechanics Technology	6,160	6,562	6,646	6,609	Cont	TBD
TOTAL	43,512	42,709	43,010	42,586	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology exploratory development effort advances the technology base for air-delivered conventional weapons to support non-nuclear Air Force missions. The program includes: (1) design and demonstration of advanced ordnance; (2) weapon guidance and flight control technologies; (3) advanced low-drag high performance weapon airframes; (4) conformal/internal carriage and separation; (5) improved submunition dispensing concepts; (6) modeling, technical assessments, and evaluation criteria for all efforts. This program element also funds the management and support of Wright Laboratory's Armament Directorate at Eglin AFB FL.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06AL: Armament Directorate Operations. This project supports and complements all other projects in the program element and provides for management, support, and operation of Wright Laboratory's Armament Directorate, Eglin AFB FL. It provides civilian salaries, transportation, rents, maintenance, communications, supplies and equipment and facilities maintenance.

2. (U) Project 2068: Advanced Guidance Technology. This project develops advanced midcourse and terminal guidance technologies for conventional weapons. It also develops advanced instrumentation systems to more effectively test new conventional weapons. Project payoffs include: all-weather delivery, increased accuracy, a "launch and leave" capability, increased number of kills per sortie, increased aircraft survivability and improved reliability and affordability.

(U) FY 1990 Accomplishments:
- (U) Completed Noncooperative Vector Scoring System flight test.
- (U) Tested an airborne video system for the Seek Eagle program.

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- (U) Completed Dual-Mode Guidance Technology project and transitioned to PE 0603601F for advanced development.

(U) FY 1991 Planned Program:
- (U) Select candidate IR/RF dome concepts capable of performing in high Mach, high maneuverability environments.
- (U) Test Have Rebound bistatic radar against flyover targets.
- (U) Complete moving target indication algorithm with an imaging IR camera integrated with a signal processor.
- (U) Upgrade the in-house Radar Signal and Image Processing capability to perform target acquisition/classification.
- (U) Complete development of quasi-optical, solid state mixer subsystem for millimeter wave (MMW) weapon guidance radar.
- (U) Continue data analysis, modeling and simulation efforts in both electro-optic (EO) and MMW areas.

(U) FY 1992 Planned Program:
- (U) Initiate real beam MMW radar seeker beam sharpening technique development for improved armored target resolution/detection.
- (U) Fabricate breadboard optical pattern recognition system.
- (U) Complete the IR/RF dome technology program.
- (U) Complete testing of Subminiature Telemetry brassboard.
- (U) Develop a low cost, solid state laser radar breadboard suitable for guiding submunitions against armored targets.

(U) FY 1993 Planned Program:
- (U) Initiate a robust MMW seeker effort for applications against varied surface target types.
- (U) Begin development of an optical correlation tracking seeker.
- (U) Initiate an autonomous seeker algorithm demonstration utilizing artificial intelligence and efficient processing of image algebra for target detection in high clutter.
- (U) Begin development of subminiature sensor technology for improved submunition guidance.

(U) Work Performed By: Project managed by Wright Laboratory's Armament Directorate, Eglin AFB FL. Major contractors are: Hughes Corp, Long Beach CA; Raytheon Co, Bedford MA; McDonnell-Douglas Corp, St Louis MO; Loral, Akron OH; and Texas Instruments, Dallas TX.

(U) Related Activities:
- (U) PE 0603601F, Conventional Weapons Technology
- (U) PE 0603363F, Armament Technology Integration
- (U) PE 0602303A, Missile Technology
- (U) PE 0604314F, Advanced Medium Range Air-to-Air Missile
- (U) PE 0604258N, Vector Scoring
- (U) There is no duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

Program Element: #0602602F Budget Activity: 1 - Technology Base
PE Title: Conventional Munitions

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2502: Ordnance Technology. This project develops advanced non-nuclear ordnance technologies for air delivered conventional weapons. The payoff from this project includes improved munitions storage capability and transportation safety, increased warhead effectiveness against buried and hardened targets, improved submunition dispensing and selectable multi-mode kill capability.

(U) FY 1990 Accomplishments:
- (U) Completed the in-house melt-cast Insensitive High Explosive (IHE) development for handling/storage safety tests.
- (U) Demonstrated aimable warhead fuze performance during target interaction ground tests.
- (U) Completed advanced 20 millimeter (mm) penetrator and High Explosive Incendiary (HEI) projectile lethality/stability testing and began development of electro-mechanical base mounted HEI projectile fuze.
- (U) Demonstrated gun gas control device design which eliminated secondary gun gas ignition and greatly reduced aircraft blast, vibration and recoil loads.

(U) FY 1991 Planned Program:
- (U) Complete an inhouse reactive fragment loading capability.
- (U) Demonstrate magnetically coupled slapper initiation.
- (U) Test anti-armor and insensitive munition fuze performance during final target interaction and warhead function.
- (U) Begin high performance IHE development.
- (U) Develop reactive fragment technology for runway defeat.
- (U) Demonstrate selective initiation of multi-mode warheads.
- (U) Complete development of 20mm ammunition fuze.

(U) FY 1992 Planned Program:
- (U) Initiate guidance integrated (adaptive) fuze development for multi-mode anti-armor warheads.
- (U) Evaluate dual-mode Target Detection Device (TDD) breadboard for low observable targets.
- (U) Design and demonstrate primary and auxiliary fuze functions for hard target penetrator.
- (U) Develop alternate fuze power sources using high energy density capacitor technology.
- (U) Develop and demonstrate IHE initiation system.

(U) FY 1993 Planned Program:
- (U) Complete adaptive anti-armor fuze breadboard design.
- (U) Demonstrate real-time hard target discrimination.
- (U) Evaluate the Navy CL-20 explosive performance potential in anti-armor warheads.
- (U) Complete dual-mode low observable TDD demonstration.

Program Element: #0602602F Budget Activity: 1 - Technology Base
PE Title: Conventional Munitions

(U) Work Performed By: Project managed by Wright Laboratory's Armament Directorate, Eglin AFB FL. Major contractors are: Martin Marietta, Orlando FL; Honeywell, Hopkins MN; Atlantic Research Corp, Gainesville VA; Motorola Inc, Scottsdale AZ; and Raytheon Co, Bedford MA.

(U) Related Activities:
(U) PE 0603601F, Conventional Weapons Technology
(U) PE 0603363F, Armament Technology Integration
(U) PE 0604314F, Advanced Medium Range Air-to-Air Missile
(U) PE 0604602F, Armament/Ordnance Development
(U) There is no duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 2543: Weapons Effectiveness Methodology. This project assesses the lethality and effectiveness of current and planned conventional weapons technology programs and assesses target vulnerability to those technologies. Payoffs include: increased technology focus and improved technology planning and weapon design.

(U) FY 1990 Accomplishments:
- (U) Built six third-scale models of three-story Automated Data Processing (ADP) center and tested penetration vulnerability using scaled-down Hard Target Ordnance munitions.
- (U) Improved lethality software for assessing weapon technologies against air-to-surface fixed and mobile targets.

(U) FY 1991 Planned Program:
- (U) Test and evaluate fixed target response (breaching and concrete structural damage) to cased-charge blast/fragments.
- (U) Evaluate hypersonic delivery dispenser effectiveness against fixed, hardened targets and enemy airfields.
- (U) Evaluate the effect of smart fuzing and improved guidance on lethality of new munition concepts.

(U) FY 1992 Planned Program:
- (U) Test and evaluate fixed target response and component damage to internal blast and validate munitions effectiveness code.
- (U) Assess effectiveness of Hard Target Ordnance concepts.
- (U) Evaluate new kill mechanisms for threat aircraft components.

(U) FY 1993 Planned Program:
- (U) Evaluate new air-to-surface and air-to-air weapon design concepts with the validated effectiveness code.
- (U) Improve assessment methods for new kill mechanisms; reactive fragments for air-to-surface weapons.

Program Element: #0602602F Budget Activity: 1 - Technology Base
PE Title: Conventional Munitions

(U) Work Performed By: Project managed by Wright Laboratory's Armament Directorate, Eglin AFB FL. The two major contractors are: Denver Research Institute, Denver CO; and Applied Research Associates, Albuquerque NM.

(U) Related Activities:
(U) PE 0603307F, Air Base Survivability
(U) PE 0603601F, Conventional Weapons Technology
(U) PE 0604602F, Armament/Ordnance Development
(U) PE 0604604F, Submunitions Development
(U) PE 0602624A, Weapons and Munitions Technology
(U) PE 0602332N, Surface/Aerospace Weapons Technology
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 2567: Aeromechanics Technology. This project funds technology efforts to improve the aerodynamic efficiency of conventional weapons. These technologies improve aircraft performance by reducing weapon drag, and will enable supersonic low-altitude weapon release, to increase aircraft survivability.

(U) FY 90 Accomplishments:
- (U) Developed Computational Fluid Dynamic (CFD) techniques for the aerodynamic analysis of hypersonic weapons.
- (U) Completed advanced lightweight composite air-to-air missile airframe (HAVE DASH IV) low drag external aircraft carriage and high density internal carriage design.
- (U) Transitioned the Expert Missile Maintenance Aid (EMMA) field-level artificial intelligence diagnostic system to Seymour-Johnson AFB for rapid trouble-shooting of munitions.
- (U) Continued flight tests of dual-spool fiber optic data link with GBU-15 test vehicle; exceeded 20 kilometer ranges.

(U) FY 1991 Planned Program:
- (U) Initiate synergistic adaptive electronic countermeasures filter/antenna for Global Positioning System (GPS) receiver for tactical weapons.
- (U) Complete fabrication and initiate flight qualification ground testing of lightweight composite missile airframe.
- (U) Continue low cost/high reliability Tri-service tactical grade miniature ring laser gyro Inertial Measurement Unit (IMU) development.
- (U) Develop Computational Fluid Dynamics (CFD) computer model to predict weapon separation from a carrier vehicle at velocity ranges beyond Mach 5.
- (U) Develop CFD prediction techniques for transonic and supersonic weapon separation from internal bays.

Program Element: #0602602F Budget Activity: 1 - Technology Base
PE Title: Conventional Munitions

(U) FY 1992 Planned Program:
- (U) Complete composite air-to-air missile flight test demonstrations using bank-to-turn steering.
- (U) Evaluate reaction control systems for very fast, highly maneuverable, compact, air-to-air missiles.
- (U) Complete in-house design and test of dual mode (eject/rail) launcher for internal carriage air-to-air missiles.
- (U) Develop CFD analyses of hypersonic carrier vehicle deployment of submunitions.

(U) FY 1993 Planned Program:
- (U) Initiate an in-house study of aerodynamic, structural, and integration technologies for hypersonic tactical missiles.
- (U) Initiate advanced autopilot for tactical weapons using artificial intelligence concepts.
- (U) Begin development of low cost IMU's using fiber optic gyro techniques.
- (U) Develop CFD modeling techniques for non-linear aero-elastic phenomena in the transonic flight regime.

(U) Work Performed By: Project managed by Wright Laboratory's Armament Directorate, Eglin AFB FL. The three major contractors are: McDonnell-Douglas, St Louis MO; Rockwell Missile Systems Division, Duluth GA; and Ford Aerospace, Newport Beach CA.

(U) Related Activities:
(U) PE 0603230F, Advanced Tactical Fighter
(U) PE 0603601F, Conventional Weapons Technology
(U) PE 0603363F, Armament Technology Integration
(U) PE 0604314F, Advanced Medium Range Air-to-Air Missile
(U) PE 0604602F, Armament/Ordnance Development
(U) PE 0604604F, Submunitions Development
(U) PE 0602201F, Aerospace Flight Dynamics
(U) PE 0602618A, Ballistic Technology
(U) PE 0602332N, Surface/Aerospace Weapons Technology
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

A: (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
06RA Laboratory Operations	38,446	41,087	41,527	41,992	Cont	TBD
2338 Assurance Techniques for Electronics	4,779	4,273	4,915	5,100	Cont	TBD
4082 Space Subsystems C3I *	0	0	3,700	6,800	Cont	TBD
4506 Surveillance Technology	8,848	7,374	9,085	9,135	Cont	TBD
4519 Communications Technology	3,973	4,300	4,285	4,415	Cont	TBD
4594 Intelligence Technology	5,492	5,340	6,430	6,455	Cont	TBD
4600 Electromagnetic Radiation, Devices, and Components	11,424	10,220	11,073	11,928	Cont	TBD
5581 Command & Control Technology	7,463	6,815	7,650	7,900	Cont	TBD
Total	80,425	79,409	88,665	93,725	Cont	TBD

* This work transferred from PE 0603428F beginning in FY 1992.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program is the primary source of new concepts, feasibility demonstrations and advanced technology for Air Force Command, Control, Communications and Intelligence (C3I). Current developments include: increased operational availability of C3I systems through improving reliability, maintainability and electromagnetic compatibility; improving effectiveness and survivability through secure communications; improving surveillance range and detection capabilities against low observable threats and enemy electronic countermeasures; and improving the timeliness and quality of intelligence data for decision making. Projects address seven technology areas: electronic reliability and maintainability; surveillance; communications; space subsystems for C^3I; intelligence; electromagnetic radiation, devices and components; computational sciences and command and control.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06RA, Laboratory Operations: This project provides the management, support, and operation of Rome Laboratory, Griffiss AFB NY and the two directorates of Rome Laboratory at Hanscom AFB MA. It provides the pay and related costs of civilian scientists, engineers, and support personnel; transportation of equipment; rents; communications and utilities costs; reproduction services; and procurement of supplies, equipment, and contractor support services for these facilities. Funds support and complements all other projects in this PE. This is a continuing program.

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

2. (U) Project 2338, Assurance Techniques for Electronics: The Air Force needs technology which increases reliability and maintainability for electronic devices and systems while assessing electromagnetic compatibility. Payoffs are increased system availability and lower life cycle costs. This effort focuses on new silicon and gallium arsenide based technology to identify and eliminate design and fabrication characteristics that result in poor reliability. It develops equipment/system reliability and maintainability techniques to be applied in development of military systems with improved operational readiness and supportability. Areas of emphasis include: techniques to design-in reliability; artificial intelligence for system maintenance; computer aided design for reliability, maintainability and testability.

(U) FY 1990 Accomplishments:
- (U) Developed Qualified Manufacturer's List for rapid insertion of new reliability and producibility assurance techniques into systems.
- (U) Completed initial data collection using new Time Stress Management Devices (TSMD), inserted within electronic subsystems to record environmental and electrical stress causes of component failures.
- (U) Completed performance specification update for the traveling wave tube using Finite Element Analysis computer analytical methods to reduce life cycle cost of a jammer tube (ALQ-99) by a factor of 15.

(U) FY 1991 Planned Program:
- (U) Develop transportable user friendly software to identify/correct manufacturing/design deficiencies early in any system life cycle.
- (U) Develop an automated, computer-based, shock and vibration reliability assessment capability for electronic systems.
- (U) Develop an integrated chip-to-system approach for a testable design for top-down allocation of system testability requirements.

(U) FY 1992 Planned Program:
- (U) Develop sensors to measure and record the electromagnetic environment emitted by circuitry within avionics equipment.
- (U) Develop and update state-of-the-art reliability prediction models for electronic devices to improve system engineering methods.
- (U) Develop applications for TSMDs to analyze and correct design deficiencies in Air Force operational systems.

(U) FY 1993 Planned Program:
- (U) Develop a general purpose, inexpensive and reliable TSMD for incorporation into Air Force operational systems.
- (U) Define a cost effective methodology for obtaining test equipment for Air Force depot and organizational levels.
- (U) Develop design guidelines for improved reliability for microelectronic devices.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB NY. Major contractors: General Electric, Pittsfield MA; McDonnell Douglas, St Louis MO;Westinghouse Electric, Baltimore MD; Hughes Aircraft, Fullerton CA; Grumman Aerospace, Bethpage NY.

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

(U) Related Activities:
(U) PE 0303126F, Long Haul Communications
(U) PE 0603617F, C3 Applications
(U) PE 0603726F, C3I Subsystem Integration
(U) PE 0603789F, C3I Technology Development
(U) PE 0604609F, Reliability, Maintainability Technology Insertion
(U) PE 0708026F, Productivity, Reliability, Availability, and Maintainability (PRAM)
(U) There is no unnecessary duplication of effort within the AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 4082, Space Subsystems C3I: This project supports the development, demonstration and transition of space based C^3I technologies. The primary focus is on technologies which significantly reduce system cost, enhance performance against small targets or increase understanding of basic phenomenology. Thrusts include radar transmit/receive (T/R) modules, radar analysis tools, algorithm development, reliability and physics of failure analysis, signal processing architectures, C3 architectures, clutter and target characterization and innovative antenna/array concepts.

(U) FY 1990 Accomplishments: (Generic technology from project 4506)
- (U) Transitioned pulse power module tester to industry.

(U) FY 1991 Planned Program: (Generic technology from project 4506)
- (U) Improve current simulation/analysis tools for space radar.
- (U) Demonstrate prototype multi-band T/R module for space system.

(U) FY 1992 Planned Program:
- (U) Initiate development of innovative antenna and electronics technologies to enhance performance while addressing system weight, cost and efficiency.
- (U) Continue signal processing algorithm/architecture development for small target detection/tracking in clutter/jamming, including multimode/multiband/multispectral concepts.
- (U) Initiate development of C3 architecture for remote tasking of sensor network.
- (U) Initiate development of next generation simulation/analysis tools for improved radar performance.

(U) FY 1993 Planned Program:
- (U) Continue development of innovative antennas and electronics.
- (U) Continue C3 architecture development.
- (U) Continue development of next generation radar analysis tools.
- (U) Continue signal processing algorithm/architecture development for small target detection/tracking in clutter/jamming, including multimode/multiband/multispectral concepts.

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB NY. Major contractors: Raytheon, Wayland MA; General Electric, Syracuse NY; Texas Instruments, Dallas TX; ITT, Roanoke VA; Atlantic Research, Rome NY; Decision Science Applications, Arlington VA.

(U) Relate Activities:
(U) PE 0603428F, Space Subsystems Technology
(U) PE 0604410F, Space Based Wide Area Surveillance
(U) There is no unnecessary duplication of effort within the AF or DOD.

(U) Other Appropriation Funds: Not Applicable

(U) International Cooperative Agreements: Space Based Radar cooperative agreement with Canada.

4. (U) Project 4506, Surveillance Technology: The Air Force needs advanced ground, airborne and space-based system concepts and technologies to improve Air Force surveillance capabilities. Major exploratory development programs include: technology for performance upgrades to existing systems, advanced line-of-sight radars, low observable surveillance, and counter-countermeasures to defeat electronic warfare threats directed at surveillance systems. These programs focus on technology such as signal processing, signal generation and control, array antenna techniques, and low-cost solid state transmit/receive (T/R) modules. This project will demonstrate techniques for radar and electro-optical systems for low cross section atmospheric targets in a severe jamming environment. A new initiative for sensor fusion will enhance the Airborne Warning and Control System (AWACS) and the Ground Tactical Air Control System (GTACS) for improved target tracking for hand-off to fighter aircraft. In the future, space-based activities will be found under project 4082 within this same program element.

(U) FY 1990 Accomplishments:
- (U) Completed instrumentation of the L, S, and C-band radars into a multispectral testbed and demonstrated fusion capability.
- (U) Developed C-band digital beamforming phased array testbed to evaluate various mainbeam nulling techniques.

(U) FY 1991 Planned Program:
- (U) Develop real-time adaptive multispectral sensor fusion and cuing techniques to improve radar track continuity and accuracy.
- (U) Develop and demonstrate multispectral T/R modules for passive or active airborne/ground sensors for low-observable surveillance.
- (U) Develop signal processing algorithms to extract low energy signals for low cross section target detection in clutter and interference.
- (U) Develop a super angular resolution target detection capability through the application of digital beam forming techniques.

(U) FY 1992 Planned Program:
- (U) Develop wideband monolithic microwave integrated circuit (MMIC) pre-selector technology for monostatic and bistatics radars.

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

- (U) Fabricate and demonstrate digital beamforming arrays for clutter/jamming rejection.
- (U) Develop real-time fusion of target feature information from multiple sensors to improve surveillance in a threat environment.

(U) FY 1993 Planned Program:
- (U) Demonstrate an integrated T/R module to do multiple functions of signal generation, reception and processing in a single package to lower system cost and reliability for ground/airborne applications.
- (U) Develop real-time fusion of signal information in a multispectral sensor to enhance target detection and tracking.
- (U) Demonstrate real-time, multistatic sensor concepts using knowledge based computer systems and various processing architectures.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB NY. Major contractors: Intercon Systems, Alexandria VA; PAR Government Systems, New Hartford NY; SENSIS, DeWitt NY; Westinghouse Electric, Baltimore MD; Georgia Tech Research Institute, Athens GA.

(U) Related Activities:
(U) PE 0603617F, C3 Applications
(U) PE 0603789F, C3I Technology Development
(U) There is no unnecessary duplication of effort within the AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 4519, Communications Technology: The Air Force needs technologies which increase communication data rates, survivability and flexibility. Communication survivability technologies include enduring networks, advanced processors, spread spectrum and adaptive antenna nulling techniques. This project improves survivability, internetting and enhances information connectivity. It includes ground, space and airborne communications using electromagnetic and optical propagation techniques supported with electronic and optical signal processing to provide secure networking of communication and surveillance systems.

(U) FY 1990 Accomplishments:
- (U) Completed design of a service manager (controller) for highly adaptive and survivable communications networks.
- (U) Completed communications analysis and burst SATCOM experiments for future MILSATCOM architectures presently under consideration.

(U) FY 1991 Planned Program:
- (U) Implement error injector units to evaluate communications security in a network design laboratory.
- (U) Develop digital signal processing simulators to evaluate network architectures in a communication signal processing laboratory.
- (U) Design optium Neural Network processors that will reduce susceptibility to jamming of adaptive antenna arrays.

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

(U) FY 1992 Planned Program:
- (U) Demonstrate integrated optical-controlled null steering to improve antijam capability of phased array communications antennas.
- (U) Demonstrate modular multi-rate programmable processors using advanced adaptive technology for LPI/AJ communications.
- (U) Integrate distributed, adaptive, multi-rate network technology into ground mobile and satellite communications terminals.

(U) FY 1993 Planned Program:
- (U) Develop specifications for adaptive multimode multiband radio.
- (U) Demonstrate holographic interconnects for optical high-speed signal processors to improve data rate and flexibility of communications.
- (U) Demonstrate network routing algorithms and techniques for enhanced reliability and efficiency for SATCOM systems.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB NY. Major contractors: Calspan, Buffalo NY; Georgia Tech Research Institute, Athens GA; Westinghouse Electric, Baltimore MD; Harris, Melbourne FL; Hughes Aircraft, Torrence CA.

(U) Related Activities:
(U) PE 0603617F, C3 Applications
(U) PE 0603726F, C3I Subsystem Integration
(U) PE 0603789F, C3I Technology Development
(U) PE 0303126F, Long Haul Communications
(U) There is no unnecessary duplication of effort within the AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 4594, Intelligence Technology: The Air Force needs technologies which improve and automate Air Force capabilities to process, fuse, and disseminate useful and timely intelligence information. This program improves recording, storage and retrieval of high data rate, large volume intelligence data; develops signal processing for signal intelligence exploitation, information deception, and unintentional emissions; develops technology for correlation and fusion of multisource data; provides advanced processing techniques for receipt, correlation analysis and display of target reports from advanced sensor system; supports advanced weapon systems through the exploration of multi-spectral, multi-source imagery; and provides advanced techniques for charting and geodesy data processing.

(U) FY 1990 Accomplishments:
- (U) Developed VHSIC (small, compact) speech enhancement unit for cockpit, communications intelligence (COMINT), non-cooperative target identification (NCTI) and communications applications.
- (U) Developed a generic cooperative expert system shell that shares knowledge and supports strategic monitoring and assessment.

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

(U) FY 1991 Planned Program:
- (U) Demonstrate effectiveness of electronic warfare manipulative deception techniques to defeat passive collection system.
- (U) Apply the computer method of Advanced Reasoning Representation to improve storage, aggregation and analysis of intelligence data.

(U) FY 1992 Planned Program:
- (U) Develop a natural language shell for improving message handling and database manipulation.
- (U) Demonstrate random access, cache associative, and 3-dimensional optical memory devices to improve data storage and retrieval.
- (U) Demonstrate the application of machine learning techniques to model-based computer vision system for image exploitation.

(U) FY 1993 Planned Program:
- (U) Apply a combined neural network/expert system to improve intelligence analysis for indications and warning systems.
- (U) Demonstrate optical interconnects for optical memories to increase speed of operation and interface with digital computers for C3I.
- (U) Complete integration of neural networks into the Imagery Exploitation 2000 testbed.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB NY. Major contractors: Adaptive Technology, Syracuse NY; Harris, Melbourne FL; *Delfin Systems*, Sunnyvale CA; SRA, Arlington VA; University of California, LaJolla CA.

(U) Related Activities:
(U) PE 0603260F, Intelligence Advanced Development
(U) PE 0603726F, C3I Subsystem Integration
(U) PE 0604750F, Intelligence Development
(U) There is no unnecessary duplication of effort within the AF or DOD.

(U) Other Appropriations Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

7. (U) Project 4600, Electromagnetic Radiation, Devices, and Components: The Air Force needs technology for the generation, control, processing and radiation of electromagnetic energy for C3I systems. The most promising technologies for improving C3I systems are electromagnetic scattering (from targets and clutter), monolithic microwave and millimeter wave integrated components, and antennas/electromagnetic wave propagation. This project develops a technology base for electronic and photonic devices and device materials for C3I systems; develops optical technology for electronic intelligence processing and data storage, real-time target recognition, and processing of various space sensors; develops control techniques for large phased array antennas; and characterizes phenomena for low observable surveillance.

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

(U) FY 1990 Accomplishments:
- (U) Designed and fabricated platinum silicide infrared camera for strategic B-52 bomber demonstration.
- (U) Invented/demonstrated several new concepts for optically fed antennas which reduces weight, bulk and interference vulnerability.

(U) FY 1991 Planned Program:
- (U) Develop quality low defect density indium phosphide wafers for application in photonic and microwave ingrated circuits.
- (U) Design radar depolarization prediction methods to reject ground clutter and enhance low observable target detection.
- (U) Fabricate a photonic feed system for a phased array antenna.

(U) FY 1992 Planned Program:
- (U) Develop spatial light modulator for phase-only correlator advanced development model for target identification.
- (U) Demonstrate performance monitoring of individual transmit/receive modules in a 1 x 64 column array to improve radar sensitivity.
- (U) Fabricate and evaluate a multichannel photonic processor to eliminate sidelobe jamming of an antenna.

(U) FY 1993 Planned Program:
- (U) Develop high temperature superconductor tunneling devices for low noise monolithic microwave integrated circuit components.
- (U) Develop 94 and 120 GHz monolithic heterostructure indium-based field effect transistor for advanced space communications.
- (U) Evaluate optical interconnects within an electronic computer to increase operational speed and reliability.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB NY. Major contractors: Calspan, Buffalo NY; Rome Research, New Hartford NY; University of Dayton, Dayton OH; Gemini, Woburn MA; Georgia Tech Research Institute, Athens GA.

(U) Related Activities:
(U) PE 0603726F, C3I Subsystem Integration
(U) PE 0603789F, C3I Technology Development
(U) PE 0303126F, Long Haul Communications
(U) There is no unnecessary duplication of effort within the AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

8. (U) Project 5581, Command and Control (C^2) Technology: The Air Force needs technologies which provide strategic and tactical commanders with improved processing and presentation of information for battle management. Technologies being developed will increase the capability, quality and reliability while reducing the cost of computer resources in C^2 systems. This project develops advanced computer software modeled after human information processing and capable of providing

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

vast improvement in military decision making. It also improves software engineering tools, software development methodologies, and software quality specification and assessment. It also develops technology in distributed systems, data bases, and optical computing; develops distributed operating systems, fault tolerance mechanisms and prototype evaluators; and develops technologies associated with knowledge based systems, expert systems, and distributed databases.

(U) FY 1990 Accomplishments:
- (U) Completed integration for knowledge-based/conventional software engineering demonstration for transition to other programs.
- (U) Developed data base tool for tactical command and control systems.

(U) FY 1991 Planned Program:
- (U) Demonstrate distributed database management system for Tactical Air Control System.
- (U) Develop library of USTRANSCOM transportation plan test cases.

(U) FY 1992 Planned Program:
- (U) Demonstrate Knowledge Based Software Assistant (KBSA) for formal software specification and verification.
- (U) Develop adaptive fault tolerance algorithms for graceful degradation in distributed computing systems for C2.
- (U) Develop techniques for automated changes to resource management policy in a distributed network for survivability of C2 systems.

(U) FY 1993 Planned Program:
- (U) Develop capability to simultaneously control the data processing and communications resources in a distributed C2 system.
- (U) Develop/demonstrate a computer based tool to generate production quality software directly from user specified requirements.
- (U) Develop model of configuration management for highly incremental environment of the KBSA.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB NY. Major contractors: Knowledge System Concept, Rome NY; Xerox, Cambridge MA; Software Solutions Products, Indialantic FL; Syracuse University, Syracuse NY; Carnegie Mellon University, Pittsburgh PA.

(U) Related Activities:
(U) PE 0603728F, Advanced Computer Technology
(U) PE 0603789F, C3I Technology Development
(U) PE 0603617F, C3 Applications
(U) There is no unnecessary duplication of effort within the AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Rome Laboratory has a joint program with the Australian Defense Research Labs on KBSA.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603106F Budget Activity: #2 - Advanced Technology Development
PE Title: Logistics Systems Technology

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2745 Logistics for Combat Weapon System Maintenance and Support	66	100	427	1,279	Cont	TBD
2940 Computer Technology for System Design	3,786	4,382	6,836	7,112	Cont	TBD
2950 Integrated Maintenance Information System (IMIS)	5,060	6,955	7,386	7,094	Cont	TBD
Total	8,912	11,437	14,649	15,485	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology Program Element (PE) develops logistics technology to reduce the cost and improve the support of current and future weapons systems. This PE will: improve the way maintenance considerations are designed into weapons systems; make engineering and maintenance data electronically available throughout the lifetime of weapons systems; provide more realistic computer-based logistics planning and combat capability assessment models; and develop portable maintenance electronic job aids. Sample savings from application of this technology include 43,000 maintenance manhours per year for just the five worst ("bad-actor") electrical components on the F-16, 23,000 manhours per year at the Air Logistics Centers (ALCs) by reducing by up to 80% false removal of components that retest satisfactory, and elimination of 2 fork-lift pallets of paper technical orders for each 24 ship F-16 deployment.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2745, Logistics for Combat Weapon System Maintenance and Support: This project develops, demonstrates, and transitions technology to improve the performance of Air Force maintenance personnel and the supportability of aircraft in both peacetime and deployed wartime environments. Products developed will show design engineers, managers, and users the impacts of proposed system modifications and retrofits on system maintainability and maintenance personnel prior to acquisition decision.

(U) FY 1990 Accomplishments:
- (U) Completed in-house data reduction of aircraft battle damage assessment and repair (ABDA/R) data received from foreign source.

(U) FY 1991 Planned Program:
- (U) Jointly with AFLC, define system (e.g. engine) repair/ modification process at a selected Air Logistics Center.

(U) FY 1992 Planned Program:
- (U) Continue definition effort; identify maintenance and

supportability shortfalls; identify/develop potential technology demonstrations. With Wright Laboratories and TAC, develop joint technology demonstration on selected modification program.

(U) FY 1993 Planned Program:
- (U) Conduct first technology demonstration at ALC. With Wright Laboratories and TAC, conduct integrated product design review of proposed system modification to identify possible impacts on field maintainability and supportability.

(U) Work Performed By: Work is performed at the Armstrong Laboratory, Logistics and Human Factors Division, Wright-Patterson AFB OH.

(U) Related Activities:
(U) PE #0602205F, Personnel, Training and Simulation.
(U) PE #0603007A, Human Factors, Personnel, and Training.
(U) PE #0603253F, Advanced Avionics Integration.
(U) No unnecessary duplication occurs within Air Force or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2940, Computer Technology for System Design: This project develops new computer-based technologies that will enable design, procurement, repair, and modification of more supportable and affordable weapons systems. These technologies permit integration of design trade-off decisions among survivability, producibility, and supportability. Sample payoffs include a 50-to-1 return on investment by preventing costly manufacturing rework and design flaws through better initial design, 50% reductions in retrofit costs for modifications, and large reductions in support costs.

(U) FY 1990 Accomplishments:
- (U) Completed a successful technology demonstration of computer data control and exchange methods in conjunction with PE #0708011F, Manufacturing Technology, at the Oklahoma City Air Logistic Center (OC-ALC).

(U) FY 1991 Planned Program:
- (U) Expand logistics center access to technical databases and digitized design tools through a follow-on field demonstration.
- (U) Demonstrate software for improved reliability and maintainability in the design of weapon systems.
- (U) Demonstrate software tools to capture and trace user system requirements in design, resulting in affordable weapons systems that meet all the users requirements.

(U) FY 1992 Planned Program:
- (U) Extend and demonstrate a previously developed computer model of maintenance technicians to allow the design of more maintainable weapons systems. Expand model to allow

estimation of maintenance times during design.
- (U) Deliver integrated data exchange and control methods for test within ALCs to permit expansion of paperless design of weapon system modifications from demonstration to routine operation, thus greatly reducing ALC costs.
- (U) Develop better and lower cost methods to model the digital and paper-based information essential to weapons system design and operation, allowing paperless system support.

(U) FY 1993 Planned Program:
- (U) Develop technology to help ALCs manage digital technical data during modification and repair of existing weapons systems. This will also help the design communities develop supportable, maintainable, and affordable new systems and upgrades to existing systems.
- (U) Continue to develop and demonstrate methods to permit system capability acquisition trade-offs using accurate and easy to use analysis tools.

(U) Work Performed By: Managed by Armstrong Laboratory, Logistics and Human Factors Division, Wright-Patterson AFB OH. Contractors are Rockwell International, Los Angeles CA; General Dynamics, San Diego CA; Boeing Computer Services, Seattle WA; and Systems Exploration, Dayton OH.

(U) Related Activities:
(U) PE #0602205F, Personnel, Training and Simulation.
(U) PE #0604740F, Computer Resource Management Technology.
(U) PE #0708011F, Manufacturing Technology.
(U) No unnecessary duplication occurs within Air Force or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2950, Integrated Maintenance Information System (IMIS): This project is developing technology for the flight line maintenance technician that will allow replacement of the paper-based Technical Order system with a hand-held computer maintenance aid. IMIS will link all technical order, diagnostic, training, scheduling, supply, and management information required by maintenance technicians, increasing combat maintenance and support. This will provide maintainers with detailed instructions of what to repair and how to repair it. Estimated savings from application of IMIS technologies are in the hundreds of millions of dollars for both operational commands and depot maintenance organizations. IMIS is coordinated with all three services. Technologies demonstrated could be applied to many current and future systems such as the F-16, F/A-18, B-2, and Advanced Tactical Fighter (ATF) aircraft and the M1A1 tank, and are specifically slated for the ATF. Commercial industry is interested in applying these technologies to improve the maintenance of airliners and automobiles.

(U) FY 1990 Accomplishments:
- (U) Conducted a successful field test on an F-16 of integrated

Program Element: #0603106F Budget Activity: #2 - Advanced Technology Development
PE Title: Logistics Systems Technology

maintenance diagnostics
- (U) Provided to the ATF System Program Office (SPO) draft DoD specifications for fully integrated digital technical information in a neutral, open architecture.
- (U) Completed detailed description of IMIS user requirements.

(U) FY 1991 Planned Program:
- (U) Conduct joint Navy/Air Force field test on an F/A-18 of fully integrated diagnostics in a neutral, open architecture called Type C data.
- (U) Provide refined draft specifications for procurement of Type C data to the ATF SPO, Air Force Logistics Command (AFLC), other DoD agencies, and industry.

(U) FY 1992 Planned Program:
- (U) Build the required hardware and software for an IMIS technology field demonstration to be conducted in FY93.
- (U) Conduct analysis to determine the payoff of IMIS for on-the-job training of maintenance technicians.
- (U) Assess depot requirements for IMIS technologies.

(U) FY 1993 Planned Program:
- (U) Conduct a base-level field test on the F-16 demonstrating and validating integration of all IMIS technologies.
- (U) Continue requirements analysis for depot application.
- (U) Deliver to the ATF SPO final specifications, validated through field test, for procurement of IMIS components.

(U) Work Performed By: Managed by Armstrong Laboratory, Logistics and Human Factors Division, Wright-Patterson AFB OH. Contractors are Systems Research Labs, Beavercreek OH; General Dynamics, San Diego CA; McDonnell Douglas Aircraft Corp, St Louis MO; and Systems Exploration, Dayton OH.

(U) Related Activities:
(U) PE #0602205F, Personnel, Training, and Simulation
(U) PE #0207219F, Advanced Tactical Fighter
(U) PE #0604708F, Generic Integ. Maint. Diagnostics Systems
(U) PE #0603721N, Integrated Diagnostic Support
(U) No unnecessary duplication occurs within Air Force or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603109F Budget Activity: #2 - Advanced Technology Development
PE Title: INEWS/ICNIA

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2273 Integrated Electronic Warfare System (INEWS)	3,377	4,738	0	0	0	73,980
2538 Integrated Communications, Navigation, Identification Avionics (ICNIA)	22,316	16,275	0	0	0	110,172
2734 Very High Speed Integrated Circuits (VHSIC) - based Subsystems	10,275	8,559	0	0	0	98,636
3003 Common Signal Processor (CSP)	0	0	0	0	0	37,098
3062 Pave Sprinter	0	0	0	0	0	3,100
Total	35,968	29,572	0	0	0	322,986

B. (U) BRIEF DESCRIPTION OF ELEMENT: Provides proof-of-concept development and demonstration of VHSIC-based advanced integrated modular avionics for the Advanced Tactical fighter (ATF) with applicability to the Navy and Army Light Helicopter, Experimental (LHX). Builds advanced development model (ADM) Subsystems under management guidance from the Wright Research and Development Center, the ATF SPO and the Joint Integrated Avionics Working Group (JIAWG). Continues technical base for long term development of JIAWG common avionics baseline for using aircraft, such as ATA, ATF, LHX.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2273, INEWS: Develops threat Warning and countermeasures capability for Low Observable aircraft which will be fully integrated into Integrated Avionics suit of the ATF, with applicability to the ATA and LHX.

(U) FY 1990 Accomplishments:
- (U) Performed IR missile warning system definition in conjunction with the parallel processor advanced development work in projected 2734.
- (U) Demonstrated advanced infrared countermeasures.
- (U) Completed AI processor modules requirements analysis.

(U) FY 1991 Planned Program:
- (U) Complete definition and initiate design of a passive IR missile warning massively-parallel processor.
- (U) Deliver INEWS system digital model to the Air Force and Navy.
- (U) Initiate development of AI processor for situation awareness.

(U) FY 1992 Planned Program:
- (U) Not Applicable

Program Element: #0603109F Budget Activity: Activity Technology Development
PE Title: INEWS/ICNIA

(U) FY 1993 Planned Program:
- (U) Not Applicable

(U) Work Performed By:
- (U) In-house work by Wright Laboratories, Avionics Laboratories and ATF SPO, Wright-Patterson AFB, OH.
- (U) Major contractors are TRW Corp., San Diego, CA; Westinghouse Electric, Baltimore, MD; Sanders Assoc, Nashua, NH; and General Electric, Utica, NY.

(U) Related Activities:
- (U) Program Element #0604250F, Integrated EW/CNI Development.
- (U) Program Element #0603230F, Advanced Tactical Fighter (Dem/Val).
- (U) Program Element #0603270F, Electronic Combat Technology.
- (U) Program Element #0604239F, Advanced Tactical Fighter (FSD).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2538, ICNIA: Develops integrated, VHSIC-based, modular Communications, Navigation, Identification (CNI) system--including integrated, multifunction antennas--applicable to the integrated avionics suites of ATF/LHX. Studies and develops specification and standards for international, collaborative CNI and advanced avionics architectures.

(U) FY 1990 Accomplishments
- (U) Fabricated, tested, and deliver ICNIA ADM Terminals #1, #2.
- (U) Begin imbedding of ICNIA ADM #3 into integrated Electromagnetic System Simulator (IESS) facility and testing of ADM #4 in IESS.
- (U) Determined LPI Situational Awareness Data Link (SADL) requirements including JIAWG commonality and fleet interpretability.

(U) FY 1991 Planned Programs:
- (U) Flight demonstrate ADM #1 in an Army UH-60 helicopter.
- (U) Finalize IESS/ADM #3 interfacing and complete ADM #4 testing.
- (U) Complete LPI SADL detail design efforts and initiate single JIAWG based implementation.
- (U) Breadboard and test critical integrated antennas and electronics.

(U) FY 1992 Planned Program:
- (U) Not Applicable.

(U) FY 1993 Planned Program:
- (U) Not Applicable.

(U) Work Performed By:
- (U) In-house work by the ATF SPO, Wright Laboratories and Avionics Laboratories, Wright-Patterson AFB, OH.
- (U) Major contractors are TRW Corp., San Diego, CA; Rockwell-Collins, Cedar Rapids IA; and Plessy, Wayne, NJ.

Program Element: #0603109F Budget Activity: Activity Technology Development
PE Title: INEWS/ICNIA

(U) Related Activities:
- (U) Program Element #0604250F, Integrated EW/CNI Development.
- (U) Program Element #0603230F, Advanced Tactical Fighter (Dem/Val).
- (U) Program Element #0604239F, Advanced Tactical Fighter (FSD).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) PROJECT 2734, VHSIC BASED SUBSYSTEMS:
Designs, develops, integrates, and tests advanced concepts in avionics. Designs and develops modular, multi-application signal and data processor systems to extend the Joint Integrated Avionics Working Group (JIAWG) module set in the area of parallel processing (supercomputers). To support the JIAWG common module validation and verification, this project funds the Demonstration of Avionics Module Exchangeability via Simulation (DAMES) effort. The DAMES is a state of the art simulation tool with the capability to handle large scale circuit designs down to the logic gate level. This simulation offers government validation and verification of module design prior to extensive Very High Speed Integrated Circuit (VHSIC) chip and hardware fabrication, and permits early software integration ahead of hardware availability. Develops and integrates technologies into elements of the integrated avionic suite which enhance the supportability of the avionics system

(U) FY 1990 Accomplishments
- (U) Developed system simulation for avionics system in coordination with lower level DAMES development.
- (U) Demonstrated the Active Star Coupler module as a risk reduction for ATF.
- (U) Continued VHSIC 1750A testing with inclusion of inclusion of the JIAWG Test and Maintenance (TM) standard bus and ADA real-time operating system.
- (U) Investigated technology insertions into the JIAWG processor ares, e.g. VHSIC 2, GaAs, advanced packaging, and fiber optics.

(U) FY 1991 Planned Program:
- (U) Conduct demonstrations in RF packaging, photonic back-plane/ connectors, integrated rack/system cooling, and advanced modules.
- (U) Demonstrate System Simulation for JIAWG architecture.
- (U) Complete parallel processing module requirements analyses and technology insertion opportunities assessment.
- (U) Initiate development of highest payoff JIAWG compatible common modules and needed software tools.

(U) FY 1992 Planned Program:
- (U) Not Applicable.

(U) FY 1993 Planned Program:
- (U) Not Applicable.

Program Element: #0603109F
PE Title: INEWS/ICNIA

Budget Activity: Activity Technology Development

(U) WORK PERFORMED BY:
- (U) In-house work by the Wright Laboratories and Avionics Laboratories, Wright-Patterson AFB, OH. RADC is responsible for the TISSS effort.
- (U) Major contractors are TRW, Dayton, OH; Harris, Melbourne, FL; Westinghouse, Baltimore, MD; Lockheed, Burbank, CA; IBM, Manassas, VA and Oswego, NY; Hughes Aircraft, Los Angeles, CA; and AT&T Bell Labs, Whippany, NJ.

(U) RELATED ACTIVITIES:
- (U) Program Element #0604250F, Integrated EW/CNI Development.
- (U) Program Element #0603225F, DoD Common Programming Language (ADA)
- (U) Program Element #0603230F, Advanced Tactical Fighter
- (U) Joint Integrated Avionics Working Group (JIAWG)
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) OTHER APPROPRIATION FUNDS: Not Applicable.

(U) International Cooperative Agreements:
- (U) US/France Bilateral MOU for development of advanced processing module set.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603112F
PE Title: Advanced Materials for Weapons Systems

Budget Activity: #2 - Adv Technology Development

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2100 Laser Hardened Materials	7,694	11,642	10,623	9,874	Cont	TBD
3153 Nondestructive Inspection Development	1,469	2,800	3,383	4,073	Cont	TBD
3946 Materials Transition	0	600	3,881	4,583	Cont	TBD
Total	9,163	15,042	17,887	18,530	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Advanced Development program demonstrates laser hardening techniques, non-destructive inspection/evaluation (NDI/E) technologies, and new aerospace materials. It explores technology options to answer Air Force needs in the following areas: laser hardening materials and designs to protect aircrew eyes, sensors, and aeronautical/aerospace systems; greatly enhanced NDI/E techniques to detect failure-causing defects and conditions in war fighting systems; and necessary processing, characterization, and scale-up data on advanced materials to reduce their transition time into system applications and to achieve their ready acceptance by designers. These new technologies are required to provide current and new aeronautical and aerospace systems the capabilities to protect against laser threats, to reliably inspect aeronautical structures, and to improve the operational performance, reliability, affordability, and supportability of current and advanced warfighting systems.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 3153, Nondestructive Inspection Development: Develops and demonstrates advanced nondestructive inspection/evaluation (NDI/E) methods and procedures to accurately monitor performance integrity and detect failure-causing defects and conditions in weapon system components and materials. NDI/E capabilities greatly influence and/ or limit many design and manufacturing processes and maintenance practices. The potential reduction in the number of warfighting systems, for example, the deactivation of fighter wings, and the need for rapid sortie generation demand an ability to perform real-time inspections much faster than our current capability. Comparison of Air Force NDI/E capabilities with requirements reveals a significant and serious deficiency. This project provides technology to satisfy critical Air Force Logistics Command requirements at the field and depot levels, as well as initial manufacturing quality, integrity, and safety assurance requirements, with increased consistency, reliability, and cost-effectiveness.

Program Element: #0603112F
PE Title: Advanced Materials for Weapons Systems

Budget Activity: #2 - Adv Technology Development

(U) FY 1990 Accomplishments:
- (U) Developed breadboard backscatter imaging X-Ray Computed Tomography (XCT) system for inspecting coatings, honeycomb structures, or cracks in dense foam sandwich structures.
- (U) Identifed XCT nondestructive inspection (NDI) methods for aeronautical systems and validate and document cost effective test procedures/equipment specifications.

(U) FY 1991 Planned Program:
- (U) Begin developing portable real-time filmless X-ray NDI system for performing rapid, reliable, and cost-effective field and depot inspections.
- (U) Begin developing an NDI system for rapid, cost-effective inspection of the accessible surfaces of large composite airframe structures used on conventional and future aircraft.
- (U) Continue the two XCT efforts.

(U) FY 1992 Planned Program:
- (U) Complete the backscatter imaging XCT program and the advanced XCT applications demonstration program.
- (U) Begin developing an NDI system that will locate hidden flaws in complex structures.
- (U) Continue the portable real-time filmless X-ray NDI system and the large composite structure NDI system efforts.

(U) FY 1993 Planned Program:
- (U) Continue to develop the portable real-time filmless X-ray NDI system for field and depot inspection.
- (U) Continue to develop the large composite structure NDI system for airframes.
- (U) Continue to develop the hidden flaw NDI system for aerospace systems.

(U) Work Performed By: The two contractors are Northrop Aircraft Co., Hawthorne, CA; and Boeing Aerospace Co., Seattle, WA. The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages this project.

(U) Related Activities:
- (U) Program Element #0602102F, Materials.
- (U) Program Element #0708011F, Industrial Base Program.
- (U) Integrated with the Air Force NDI Program Office, San Antonio TX.
- (U) No duplication of effort within the Air Force or the DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0603112F
PE Title: Advanced Materials for Weapons Systems

Budget Activity: #2 - Adv Technology Development

2. (U) Project 3946, Materials Transition: Develops necessary processing and scale-up data on new classes of advanced materials to shorten transition times into system applications. Focuses on applying a material's capabilities to a system's needs. Develops information needed to prove manufacturing feasibility and reliable properties/performance behavior for the intended use. Provides the detailed engineering data and failure/fatigue behavior required by designers.

(U) FY 1990 Accomplishments:
- (U) Not applicable.

(U) FY 1991 Planned Program:
- (U) Begin to measure materials transition data for nickel aluminide alloys for lighter weight turbine engine components and single crystal turbine engine blades.

(U) FY 1992 Planned Program:
- (U) Begin effort to improve rain erosion resistance of infrared windows at Mach 2 and increase window life by an order of magnitude at low speed.
- (U) Begin effort to demonstrate advanced materials/protection methods that will double the lifetime of current metallic aircraft materials subjected to corrosive environments.
- (U) Begin effort to prove that ceramic matrix composites (CMC) improve high temperature performance and radar signature control of thrust vectoring aircraft nozzles.
- (U) Continue nickel aluminide work.

(U) FY 1993 Planned Program:
- (U) Continue to develop materials transition data for nickel aluminide alloys for light-weight, low-cost turbine blades.
- (U) Continue effort on erosion resistant infrared windows.
- (U) Continue effort corrosion protection of metallic aircraft components.
- (U) Continue development of high temperature CMCs for aircraft nozzles.

(U) Work Performed By: To be determined by competitive source selection in FY 1991. The Wright Laboratory, Materials Directorate, Wright-Patterson AFB OH, manages this project.

(U) Related Activities:
(U) Program Element (PE) #0602102F, Materials.
(U) PE #0603211F, Aerospace Structures.
(U) PE #0603202F, Aerospace Propulsion Subsystem Integration.
(U) PE #0603216F, Aerospace Propulsion and Power Technology.
(U) PE #0708011F, Industrial Base Program.
(U) No duplication of effort within the Air Force or the DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Dr Hall/SAF/AQT/57866/12 Feb 91

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603112F
PE Title: Advanced Materials for Weapons Systems
Project Number: 2100
Budget Activity: #2 - Adv Technology Development

A. (U) RESOURCES ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Laser Hardened Materials	7,694	11,642	10,623	9,874	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES: This project develops and demonstrates new materials and design concepts for protecting Air Force space and airborne systems and personnel against laser radiation. A significant threat exists for all Air Force systems and aircrews. It is projected to grow considerably in the near term. The goal is to ensure system mission accomplishment both during and after the laser threat encounter. Specific goals include protection against interference of automated subsystems (spoofing), denial of information to subsystems (jamming), and functional damage. Approaches are demonstrated on representative hardware to ensure that validated hardening options are available for transition to Air Force systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Completed design of interim broadband laser eye protection for aircrews.
   - (U) Reviewed five innovative optical sensor designs which provide laser survivability with no sacrifice in performance; transition these designs to a brassboard demonstration/validation program.
   - (U) Reviewed broadband laser eye protection concepts for MAC and SAC aircrews.
   - (U) Reviewed testing the hardened reconnaissance optics system in preparation for transitioning the design to system designers.

2. (U) FY 1991 Planned Program:
   - (U) Complete development of high temperature laser hardened transparency materials system; transition results into a new integrated transparency effort that scales up the hardening technique to a canopy section.
   - (U) Complete testing advanced broadband laser eye and sensor protection for MAC and SAC; transition technology to an implementation program to integrate sensor and personnel hardening.
   - (U) Initiate program to develop design data to transition hardening materials to aeronautical systems.
   - (U) Select, fabricate, and test components to evaluate laser vulnerability of aircraft structural materials; model damage and assess system and mission implications.

Program Element: #0603112F
PE Title: Advanced Materials for Weapons Systems
Project Number: 2100
Budget Activity: #2 - Adv Technology Development

- (U) Initiate Survivable High-Performance Sensor (SHPS) Program, which will fabricate/evaluate the best laser survivable sensors from the program completed in FY 90.
- (U) Initiate effort to examine hardening technologies suitable for laser radar systems.
- (U) Initiate effort to develop advanced materials and processes for optical limiter devices for protecting aircrews, sensors, and space systems against laser radiation.

3. (U) FY 1992 Planned Program:
   - (U) Transition optical bandpass filter technology made with metallic sub-micron structure patterns to developers of forward looking infrared and infrared windows and optics systems.
   - (U) Transition interim (limited night capability) broadband tactical aircrew protection to aircrew life support developers.
   - (U) Initiate effort to develop lightweight broadband laser hardening with a night capability for aircrews.
   - (U) Initiate effort to provide advanced materials and processes for making optical filters and optical switches that protect aircrews, sensors, and space systems against laser radiation.
   - (U) Complete the integrated holographic devices program, which will provide day/night, fixed line, aircrew laser protection technology ready for transition.
   - (U) Continue ongoing efforts on fabricating and evaluating laser survivable sensors, hardening technologies for laser radar systems, advanced materials and processes for optical limiter devices.

4. (U) FY 1993 Planned Program:
   - (U) Complete the integrated transparency effort started in FY 91; transfer technology to the aircraft program offices.
   - (U) Complete the optical limiter devices effort; transition the technology to sensor and personnel protection programs and sensor developers.
   - (U) Continue ongoing efforts on laser survivable sensors, hardening technologies for laser radar systems, advanced materials and processes for optical limiter devices, optical filters, and optical switches, lightweight broadband night vision capable protection for aircrews.

5. (U) Program To Completion: This is a continuing program.

D. (U) WORK PERFORMED BY: This program is managed by the Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH. The top five contractors are McDonnell-Douglas Corp, St Louis, MO; Texas Instruments, Dallas, TX; Honeywell, Bloomington, MN; Loral, Phoenix, AZ; and Illinois Institute of Technology Research Institute, Chicago, IL.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: None
3. (U) COST CHANGES: None

Program Element: #0603112F
PE Title: Advanced Materials for Weapons Systems
Project Number: 2100
Budget Activity: #2 - Adv Technology Development

F. (U) PROGRAM DOCUMENTATION:
- (U) Program Management Directive (PMD) 2140(16)/0603211F
- (U) AF SON 505-87, Aircrew Ocular Laser Protection, 11 Oct 88
- (U) SAC SON 17-87 (Draft), Integrated Protection Aircraft Transparency, 1 May 87.

G. (U) RELATED ACTIVITIES:
- (U) Program Element #0602102F, Materials.
- (U) Program Element #0602202F, Human Systems Technology.
- (U) Program Element #0603231F, Crew Systems Technology.
- (U) Program Element #0604706F, Life Support System.
- (U) Program Element #0708011F, Industrial Base Program.
- (U) Coordinated with other Department of Defense and government activities through the Triservice Laser Hardening Materials and Structures Working Group.
- (U) No unnecessary duplication of effort within the Air Force or the Department of Defense.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1.	(U)	Transition High Temperature, Laser Hardened Materials and Coatings to Mission Integrated Transparency System Program (Program Element #0603211F)	Jun 1991
2.	(U)	Optical Switches Contract Start	Sep 1992
3.	(U)	Test Out-of-Band Protection for Canopies and Structures	Dec 1992
4.	(U)	Variable Frequency Laser Eye Protection CDR	Mar 1993
5.	(U)	"Smart" Laser Eye Protection for Aircrews CDR	Jun 1994
6.	(U)	Survivable High Performance [All-Purpose] Sensor CDR	Dec 1994

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603202F
PE Title: Aircraft Propulsion Subsystem Integration (APSI)
Project Number: 668A
Budget Activity: #2 -Adv Tech Devel

A. (U) RESOURCES ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
APSI	19,558	20,527	30,295*	31,488*	Cont	TBD

* Funding increase needed to complete IHPTET Phase I testing and to design and build new experimental engines for IHPTET Phase II.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Provides for the design, development, test, and assessment of air-breathing propulsion system technologies applicable to a broad range of aircraft and missiles. The APSI program has three distinct tasks. Task I develops system component technology such as low pressure fans and turbines, engine controls, and nozzles. Task II includes demonstrator engines such as the Joint Technology Demonstrator Engine (JTDE) for manned systems and the Expendable Turbine Engine Concept (ETEC) for cruise missile applications. These demonstrator engines apply the core technology developed under the Advanced Turbine Engine Gas Generator (ATEGG) program. Task III focuses on system integration issues such as inlets, nozzle, engine/airframe compatibility and low observable technologies. This program will provide air vehicles with 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 resulting in increased mission effectiveness. The APSI program supports the Integrated High Performance Turbine Engine Technology (IHPTET) initiative. IHPTET is a three phase, totally integrated DOD, DARPA, NASA, and industry effort focused on doubling turbine engine propulsion capability (over ATF engine) by the year 2005. Each IHPTET phase will accomplish one third of the overall goal while transitioning interim technology to new/current weapon systems during the program.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Initiated tests of Garrett, Teledyne, and Williams ETECs demonstrating IHPTET Phase I goals for missile engines.
   - (U) Rig tested Pratt & Whitney swept aero compressor fan. This fan produced a 3% efficiency gain with a 24% decrease in weight.
   - (U) Rig tested a General Electric hollow, swept fan stage which showed a 10% weight reduction and 25% stage loading increase.

2. (U) FY 1991 Planned Program:
   - (U) Complete Pratt & Whitney JTDE tests for IHPTET Phase I demonstrating a 22% improvement in thrust-to-weight.
   - (U) Test General Electric JTDE for IHPTET Phase I to demonstrate fighter engine technologies with 15% fuel savings.
   - (U) Test DARPA carbon/carbon turbine in ETEC engine. This will demonstrate IHPTET Phase II turbine goals for missiles.

Program Element: #0603202F
Title: Aircraft Propulsion Subsystem Integration (APSI)

Project Number: 668A
Budget Activity: #2 - Adv Technology Development

3. (U) FY 1992 Planned Program:
   - (U) Fabricate hollow titanium metal matrix composite fan blades for Pratt & Whitney JTDE. These blades will provide a 30% weight savings and improve compressor efficiency.
   - (U) Complete IHPTET Phase I testing for expendable cruise missile engines. This will demonstrate a 35% improvement in specific thrust, 20% fuel savings, and 30% reduction in cost.
   - (U) Design and fabricate Air Force/Navy Joint Expendable Turbine Engine Concept (JETEC) to demonstrate IHPTET Phase II goals for cruise missile engines.
   - (U) Rig test flight critical propulsion control systems which will allow a 25% weight reduction with a 3-fold increased processing capability for advanced nozzle integrations.
   - (U) Complete rig tests on lightweight metal matrix composite bearing support structures for JTDE, demonstrating increased vibration damping capability with 25% weight reduction.

4. (U) FY 1993 Planned Program:
   - (U) Conduct engine testing of an Advanced Exhaust System Cooling Concept to reduce cruise missile infrared signature.
   - (U) Initiate JETEC engine tests. These tests will demonstrate 50% of the IHPTET Phase II goals for cruise missile engines.
   - (U) Fabricate JTDE multifunctional nozzle providing new capability for low observable, pitch/yaw thrust vectoring.
   - (U) Conduct Pratt & Whitney JTDE fan rig test of swept, hollow diffusion bonded blades showing a 20% weight savings and 26% increased specific thrust capability.
   - (U) Complete IHPTET Phase I JTDE tests at Pratt & Whitney with an altitude test to demonstrate a 33% increase in thrust-to-weight and 20% fuel savings for an advanced fighter engine.
   - (U) Complete preliminary design of the IHPTET Phase II JTDE.

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

D. (U) WORK PERFORMED BY: This program is managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. Contractors involved in this program are: Allison Gas Turbine Division, Indianapolis IN; Garrett Engine Division, Phoenix, AZ; General Electric, Evendale, OH; Pratt & Whitney Aircraft, West Palm Beach, FL; Teledyne/CAE, Toledo, OH; and Williams International, Walled Lake, MI.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: The Inlet and Nozzle Concepts for Advanced Air-breathing Propulsion Systems (INCAAPS) program and Short Takeoff and Vertical Landing (STOVL) airframe/propulsion integration efforts were terminated due to FY 91 funding constraints.

2. (U) SCHEDULE CHANGES: Advanced vectoring/reversing nozzle test slipped from FY 93 to FY 94 and IHPTET Phase II turbofan engine test slipped from FY 95 to FY 96.

3. (U) COST CHANGES: Funding constraints, resulting in delay/cancellation

Program Element: #0603202F | Project Number: 668A
Title: Aircraft Propulsion Subsystem Integration (APSI) | Budget Activity: #2 - Adv Technology Development

of supporting development efforts, will stretch out IHPTET Phase II completion and cause a 5 to 8% increase in program costs.

F. (U) PROGRAM DOCUMENTATION: Program is documented with technical reports, papers, and presentations.

G. (U) RELATED ACTIVITIES:
- (U) PE #0602203F, Aerospace Propulsion.
- (U) PE #0602102F, Materials.
- (U) PE #0602201F, Aerospace Flight Dynamics.
- (U) Closely related to Advanced Turbine Engine Gas Generator (ATEGG) Project 681B, PE 0603216F which is managed from same office and provides core gas generator development efforts.
- (U) Integrated with the Navy PE 0602122N Aerospace Propulsion and PE 0603210N Advanced Aircraft Propulsion Systems. The Air Force and the Navy have formal Memorandums of Understanding covering efforts under the Joint Technology Demonstrator Engine (JTDE) program and the Joint Expendable Turbine Engine Concept (JETEC).
- (U) Part of DoD Integrated High Performance Turbine Engine Technology (IHPTET) initiative which combines efforts of Air Force, Navy, Army, DARPA, and NASA in turbopropulsion. The goal of IHPTET is to demonstrate minimum weight, high core power engine technology that offers at least 100% improvement over state-of-the-art technology by the year 2005.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1.	(U) High Efficiency Swept Fan Test	Jul 90
2.	(U) ETEC Sea level Mach 2 testing at AEDC	Oct 90
3.	(U) Initial JTDE Test for IHPTET Phase I	Oct 90
4.	(U) ETEC test with DARPA ELITE Carbon/Carbon turbine	Jul 91
5.	(U) Hollow MMC Fan Blade Fabrication	Sep 92
6.	(U) JTDE IHPTET Phase I goals demonstration	Jan 93
7.	(U) JTDE IHPTET Phase II Swept-Fan rig test	Apr 93
8.	(U) JETEC Phase II test	May 93
9.	(U) JETEC Infrared signature testing	Sep 93
10.	(U) Advanced vectoring nozzle engine test	Nov 94
11.	(U) Initial JTDE IHPTET Phase II test	Dec 95

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603203F Budget Activity: #2 - Advanced Technology Development
PE Title: Advanced Avionics for Aerospace Vehicles

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Comp	Total Program
69CK, Advanced Electronics	3,537	5,400	6,200	6,450	Cont	TBD
69DF, Attack Management	4,476	5,888	6,749	7,162	Cont	TBD
665A, Electro-Optical Targeting Sensors	5,468	7,153	7,215	7,775	Cont	TBD
1177, Target Recognition	3,239	5,240	6,112	6,718	Cont	TBD
2334, Airborne Radar Electronic Counter-Countermeasures	5,005	5,325	5,415	6,015	Cont	TBD
2345, Covert Airborne Communications	2,450	3,302	6,310	6,624	Cont	TBD
Total	24,175	32,308	38,001	40,744	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Future military force structures must contain combat aircraft able to defeat increasingly sophisticated active and passive countermeasures, destroy a wider variety of targets, and perform complex missions more reliably with less logistics support. This Science and Technology program element is the principal source for development of advanced aircraft electronics technology to find, identify, and attack targets. This program supports improvements of electro-optical sensors for target acquisition; techniques for target identification; electronic counter-countermeasures for tactical airborne radars; covert airborne communications; and fire control/weapon delivery for both air and ground targets. Special emphasis is given to technologies required to locate, identify, and target mobile (SCUD like) relocatable targets. This PE also supports development of advanced electronic devices for military needs. The focus of this investment is to provide avionics technology for flexible, multi-function/multi-mission aircraft that can safely penetrate threat areas; destroy multiple ground targets per pass; perform air combat with positive beyond visual range detection and identification of targets within a complex mix of look-alike friendly, neutral and enemy aircraft. Emphasis is on systems that may be quickly adapted to changes in target signatures and background environments. Force multiplication occurs through use of aircraft internetting for shared situation information and improved mission coordination.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 69CK, Advanced Electronics: This the main AF source of advanced electronic device development for radar, weapon delivery, reconnaissance, and electronic countermeasures (ECM). It demonstrates and transitions devices, circuits and subsystems that improve

performance, reliability and affordability. It develops monolithic solid state transmit/receive (T/R) modules for airborne radar; high speed analog-to-digital converters (ADCs) and advanced memory/logic for ECM; high reliability power distribution; micro-wave (MW) and microelectronic (ME) packaging and interconnect techniques; and advanced laser radar sources and detector arrays.

(U) FY 1990 Accomplishments:
- (U) Transitioned laser radar detector for tactical and cruise missile application.
- (U) Built advanced T/R modules for airborne fire control radar.

(U) FY 1991 Planned Program:
- (U) Initiate ME packaging/power effort for signal processors.
- (U) Develop MW packaging and interconnects for high performance, reliable and economical radar and EW systems.

(U) FY 1992 Planned Program:
- (U) Demonstrate high volume, low cost T/R module packaging capability for fire control radar.
- (U) Provide MW devices and circuits for a broad range of radar applications.
- (U) Demonstrate backplane power module for lower cost, reliable power distribution systems.

(U) FY 1993 Planned Program:
- (U) Provide the detector capability for a mid-IR laser for ECM.
- (U) Demonstrate packaging/interconnect design for 10 times performance and failure free life radar signal processors.
- (U) Develop X-band ADCs for tactical radar/pre-processing integration for faster better target detection.

(U) Work performed BY: Contractors include: Hughes, El Segundo CA; TI, Dallas TX; AT&T, Murray Hill NJ; Rockwell, Thousand Oaks CA; and Honeywell Bloomington, NM. This project is managed by Wright Laboratory, Wright-Patterson AFB OH.

(U) Related Activities:
(U) DOD Advisory Group on Electron Devices coordinates this work.
(U) PE #0603270F, Electronic Combat Technology.
(U) PE #0603706E, Microwave/Millimeterwave Integrated Circuits.
(U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds (& in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 69DF, Attack Management: This project develops the necessary technology to effectively integrate all available fire control information to provide the pilot with an accurate fire control solution

Program Element: #0603203F Budget Activity: #2-Advanced Technology Development
PE Title: Advanced Avionics for Aerospace Vehicles

in combat situations. Some specific technologies include integration of avionics and weapons fire control systems, attack management decision aids, intra-flight mission management, cooperative engagement techniques. These will improve combat performance against both air and ground targets. Emphasis over the next several years will include demonstration of avionics fire control integrated with weapons such as AMRAAM to improve weapon delivery accuracies.

(U) FY 1990 Accomplishments:
- (U) Verified Air-to-Air Attack Management (A3M) design through pilot-in-the-loop simulation.
- (U) Verified Multiple Target Attack (MULTACK) air-to-ground weapon delivery software for strike aircraft by simulation.

(U) FY 1991 Planned Program:
- (U) Design an active and passive sensor combination with automatic target recognizer for improved performance against stationary and mobile ground targets.
- (U) Evaluate A3M effectiveness through pilot-in-the loop comparative testing with generic tactical fighter aircraft to validate internetted flight capability.

(U) FY 1992 Planned Program:
- (U) Fabricate and integrate IRTS automatic target recognizer with sensor and begin laboratory and tower testing.
- (U) Develop an integrated fire control and weapon delivery (IFWD) solution to improve accuracy and flexibility for tactical aircraft carrying AMRAAM.

(U) FY 1993 Planned Program:
- (U) Develop air-to-surface internetted fire control flight algorithms for premission planning for mobile ground targets.
- (U) Develop next generation sensor manager to improve identification of airborne targets.
- (U) Integrate IFDW software with AMRAAM captive carry into F-15 simulator to demonstrate improved system effectiveness.

(U) Work performed By: The Wright Laboratory, Wright-Patterson AFB OH manages this project. Contractors include: McDonnell Douglas, St Louis MO; Northrup, Hawthorne CA; and Boeing, Seattle WA.

(U) Related Activities:
- (U) PE 0602204F, Aerospace Avionics
- (U) PE 0603205F, Flight Vehicle Technology
- (U) PE 0603253F, Advanced Avionics Integration
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0603203F Budget Activity: #2-Advanced Technology Development
PE Title: Advanced Avionics for Aerospace Vehicles

3. (U) Project 665A, Electro-Optical Targeting Sensors: This Science and technology project develops the electro-optic sensor technology necessary to achieve a precise, real-time combat capability against both air and ground targets. It identifies and develops critical active and passive sensor technologies required to increase electro-optical sensor capabilities to detect, locate and strike fixed and mobile ground targets.

(U) FY 1990 Accomplishments:
- (U) Completed design of a dual band thermal imaging sensor.
- (U) Determined laser radar requirements to detect camouflaged and concealed targets.

(U) FY 1991 Planned Program:
- (U) Initiate focal plane array design rule development for air-to-air covert sensor and plan passive ranging experiment.
- (U) Begin critical component fabrication of strategic targeting laser radar.

(U) FY 1992 Planned Program:
- (U) Assemble and laboratory test critical components of a long range laser radar test bed.
- (U) Demonstrate passive ranging and high density focal plane for an integrated offensive defensive air-to-air sensor.
- (U) Design and develop a novel integrated active and passive infrared sensor capitalizing on attributes of both forward looking infrared (FLIR) and laser radars for standoff air-to-ground tactical and strategic combat missions.

(U) FY 1993 Planned Program:
- (U) Develop strategic targeting laser radar technology to enhance attack capabilities against relocatable targets. Demonstrate improved targeting with a field test against camouflaged targets.
- (U) Develop covert air-to-air integrated electro-optical sensor to satisfy both offensive and defensive requirements.
- (U) Fabricate integrated active passive sensor with automatic target recognizer for both tactical and strategic missions.

(U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB OH manages this project. Contractors include: Hughes Aircraft Co., El Segundo CA; Martin Marietta, Orlando FL; Loral Infrared Imaging Systems, Lexington MA; Rockwell International, Anaheim CA; and Ford Aerospace, Newport Beach CA.

(U) Related Activities:
- (U) PE 0602204F, Aerospace Avionics.
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: Not Applicable

Program Element: #0603203F Budget Activity: #2-Advanced Technology Development
PE Title: Advanced Avionics for Aerospace Vehicles

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 1177, Target Recognition: This project develops and demonstrates the avionics hardware and algorithm technology required to achieve positive, high confidence identification of either airborne or ground targets at ranges compatible with our tactical air-to-air and air-to-ground weapons, day or night, in adverse weather, and in high threat, multiple target arenas.

(U) FY 1990 Accomplishments:
- (U) Demonstrated ultra-high range resolution (UHRR) waveform in an operational fire control radar.
- (U) Validated by comparison with actual signatures a computer model for synthetic UHRR signature generation.
- (U) Began target classification algorithm development for synthetic aircraft signature data.

(U) FY 1991 Planned Program:
- (U) Transition specification to ATF contractors to include UHRR Non-Cooperative Target Identification (NCTI) capability in airborne intercept radar.
- (U) Demonstrate feasibility of a model based algorithm to provide sensor fusion for air-to-air identification.

(U) FY 1992 Planned Program:
- (U) Real-time demonstration of UHRR NCTI in a ground-to-air mode.
- (U) Demonstrate model-based air-to-air target recognition algorithms in air target algorithm testbed for air-to-air identification.

(U) FY 1993 Planned Program:
- (U) UHRR NCTI ground-to-air demonstration in an operational exercise at Red Flag.
- (U) Demonstrate model-based air-to-ground forward looking Infrared (FLIR) and laser sensor algorithms in flight demonstration.

(U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB OH manages this project. Contractors include: General Dynamics, Pomona CA; Hughes Aircraft, El Segundo CA; Georgia Technology Research Institute, Atlanta GA; and Honeywell, Minneapolis MN.

(U) Related Activities:
(U) PE 0602204F, Aerospace Avionics.
(U) PE 0603742F, Non-Cooperative Target Recognition Technology.
(U) Efforts are coordinated through the NCTR working group.
(U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0603203F Budget Activity: #2-Advanced Technology Development
PE Title: Advanced Avionics for Aerospace Vehicles

5. (U) Project 2334, Airborne Radar Electronic Counter-Countermeasures (ECCM): Future airborne weapon system radars must operate in intense electronic combat environments. This project develops methods to reduce radar susceptibilities to hostile electronic countermeasures (ECM), and is an integral part of the DOD Electronic Combat Plan and the Air Force ECCM Master Plan.

(U) FY 1990 Accomplishments:
- (U) Updated system design for Electronic Combat Multifunction Radar technology (EMR-T) development to provide a robust ECCM capability for advanced radar systems.
- (U) Designed EMR-T critical components to allow wideband array packaging; Rotman Lens, for wideband operation; multiplex filter for simultaneous transmit and receive (STAR) operation.

(U) FY 1991 Planned Program:
- (U) Fabricate EMR-T critical components.
- (U) Conduct roofhouse demonstration of STAR ECCM strategies.
- (U) Assess radar ECM vulnerabilities quantitatively by laboratory testing to expand the technical data base on airborne radar.
- (U) Identify techniques to combat the high priority terrain-bounce jamming ECM threat to minimize airborne radar susceptibilities.

(U) FY 1992 Planned Program:
- (U) Integrate and evaluate EMR-T components.
- (U) Transition the STAR ECCM strategies to EMR-T.
- (U) Verify performance of ECCM techniques through flight test.

(U) FY 1993 Planned Program:
- (U) Test and evaluate the critical components of the EMR-T system for incorporation into a possible flight test.
- (U) Develop architecture for the flyable advanced Radar ECCM demonstration Brassboard.
- (U) Develop methods/strategies to combat future ECM threats.

(U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB OH manages this project. Contractors include: Hughes Aircraft Co., El Segundo CA; Raytheon Co., Tewksbury MA; and Georgia Technology Research Institute, Atlanta GA.

(U) Related Activities:
(U) PE 0602204F, Aerospace Avionics
(U) PE 0603253F, Advanced Avionics Integration
(U) There is no unnecessary duplication of effort within the Air Force or The Department of Defense.

(U) Other Appropriation Funds: ($ in Thousands): Not Applicable

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0603203F Budget Activity: #2-Advanced Technology Development
PE Title: Advanced Avionics for Aerospace Vehicles

6. (U) Project 2345, Covert Airborne Communications: Radio system detectability must be reduced to keep communications from being the mechanism by which aircraft are detected. Advanced radio frequency and digital assemblies are being developed to maintain common reconnaissance/intelligence data link hardware compatibility and interoperability as Low Probability of Intercept (LPI) and Jam Resistant (JR) technologies are transitioned.

(U) FY 1990 Accomplishments:
- (U) Completed Airborne Imagery Transmission (ABIT) component fabrication for reconnaissance/intelligence communications.
- (U) Designed low data rate covert airborne voice terminal at 2.4 Kbits to provide critical link for wingman operations.

(U) FY 1991 Planned Program:
- (U) Fabricate low data rate covert radio terminals.
- (U) Begin detailed design of LPI intra-flight data link at 100-500 Kb/s for raw sensor data for cooperative fire control.

(U) FY 1992 Planned Program:
- (U) Complete preliminary design of LPI intra-flight data link system, including both TAF and SOF requirements.
- (U) Ground test and transition to a System Program Office ABIT reconnaissance/intelligence air-to-air data link technology.
- (U) Complete fabrication of low data rate covert terminal.

(U) FY 1993 Planned Program:
- (U) Ground test low data rate covert data terminals.
- (U) Complete critical design and fabricate three LPI intra-flight data link terminals.

(U) Work Performed By: This project is managed by Wright Laboratory at Wright Patterson Air Force Base OH. Contractors involved are: Qualcomm, Inc, San Diego CA; Unisys, Salt Lake City UT; Hazletine Corp., Greenlawn NY; Northrup Aircraft Div., Hawthorne CA. Hughes Aircraft, Fullerton CA.

(U) Related Activities:
(U) PE 0602204F, Aerospace Avionics.
(U) PE 0207217F, Tactical Air Reconnaissance System.
(U) This program supports and is coordinated with the Tri-service Defense Support Program office.
(U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY SHEET

Program Element: #0603205F Budget Activity: #2 - Advanced Technology Development
PE Title: Aerospace Vehicle Technology

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2506 Control of Flight	1,832	1,900	2,700	3,700	Cont	TBD
2508 Aeromechanics/Vehicle Subsystems	635	1,450	4,269	4,470	Cont	TBD
2978 Reliability and Maintainability	4,541	4,691	5,604	9,766	Cont	TBD
3422 Integrated Control/Avionics Technology	10,463	12,721	10,285	6,343	Cont	TBD
Total	17,471	20,762	22,858	24,279	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Develops and validates component technologies to improve aerodynamics, flight control systems, and vehicle subsystems for current and future aircraft. Emphasis is on improved reliability & maintainability (R&M), performance, survivability, and lower cost. This Program Element (PE) develops technologies that will be flight tested in PE 0603245F, Advanced Flight Technology Integration (these two PEs complement each other). Increased project 2506 FY92 funding reflects start of electric actuator and brake program testing. Increased project 2508 FY92 funding reflects start of innovative aerodynamic control device work for future fighters. Increased project 2978 FY93 funding reflects integration of flight controls with propulsion controls to increase aircraft survivability. Decreased project 3422 FY93 funding reflects completion of Integrated Control and Avionics for Air Superiority (ICAAS) program simulation work.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2506, Control of Flight: Develops flight control technologies, including integration of flight/propulsion control (IFPC) and vehicle management system technologies, for improved total aircraft efficiency, performance and maneuverability. Includes the development of electrically powered actuation and brake systems to eliminate a centralized hydraulic system and associated maintenance problems. Develops pitch axis thrust vectoring/reversing (TV/TR) exhaust nozzle technology to demonstrate a short takeoff/landing (STOL) capability and improved maneuverability. Develops vehicle propulsion integration concepts to optimize vehicle performance and develops improved control and maneuverability technology (pitch and yaw vectoring nozzles) at reduced weight, radar cross section and drag. Develops an integrated vehicle subsystem concept to reduce the number of individual control boxes required in an aircraft and to provide efficient subsystem data exchange.

Program Element: #0603205F Budget Activity: #2 - Advanced Technology Development
Title: Aerospace Vehicle Technology

(U) FY 1990 Accomplishments:
- (U) Completed STOL/MTD maneuver enhancement nozzle cooling and thrust reversing actuator design and installation.
- (U) Completed STOL autonomous landing guidance tests of night landing without ground aids.

(U) FY 1991 Planned Program:
- (U) Complete flight test of electric actuator design geared towards reducing hydraulic system problems.
- (U) Complete IR signature evaluation of STOL nozzle.
- (U) Assess multi-axis thrust vectoring concepts.

(U) FY 1992 Planned Program:
- (U) Develop integrated subsystem concepts to combine design and control functions to significantly improve reliability.
- (U) Develop design for an advanced electric brake system to reduce/eliminate aircraft hydraulic system dependence.
- (U) Complete ground test of multi-axis TV nozzle concept.
- (U) Design fault-tolerant, integrated flight/propulsion controls.

(U) FY 1993 Planned Program:
- (U) Design integrated aircraft subsystems to optimize performance.
- (U) Complete flight tests of advanced electric actuators.
- (U) Complete integration and taxi tests of electric brakes.
- (U) Complete preliminary design of fault-tolerant IFPC.

(U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright Patterson AFB, OH. The top two contractors are McDonnell Douglas Aircraft Co., St Louis MO; and General Dynamics, Fort Worth TX.

(U) Related Activities:
(U) Program Element #0602201F, Aerospace Flight Dynamics
(U) Program Element #0603216F, Aerospace Propulsion and Power
(U) Program Element #0603230F, Advanced Tactical Fighter
(U) Program Element #0603245F, Adv Flight Technology Integration
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2508, Aeromechanics/Vehicle Subsystems: Develops aerodynamic technology and subsystems for improved maneuverability, agility, reliability, and performance at a lower cost. Includes aerodynamic technologies for safe high angle-of-attack (AOA) operation using aircraft front end vortex flow control (VFC). Develops aerodynamic control devices for improved air vehicle flight maneuvers, a low cost short landing capability, and

Program Element: #0603205F Budget Activity: #2 - Advanced Technology Development
Title: Aerospace Vehicle Technology

the elimination of aircraft vertical tails. Develops a blended aerodynamic/propulsion scheme for Special Operations Forces (SOF) transport. Develops hybrid laminar flow control (HLFC) which uses wing leading edge suction to produce less drag on transport aircraft wings for up to 15% fuel savings for transport aircraft. Develops low drag, low observable (LO), external weapon carriage concepts for incorpating air-to-surface weapons on fighter aircraft, and integrated closed-loop environmental control system (ICECS) concepts for cockpit/avionics cooling and increased range.

(U) FY 1990 Accomplishments:
- (U) Completed HLFC fabrication and flight testing.

(U) FY 1991 Planned Program:
- (U) Conduct LO external weapon carriage wind tunnel testing.
- (U) Complete HLFC flight test data analysis.

(U) FY 1992 Planned Program:
- (U) Complete LO weapons carriage analysis and transition data.
- (U) Fabricate aerodynamic control device models.
- (U) Design a VFC control system for flight testing.

(U) FY 1993 Planned Program:
- (U) Complete ground test of VFC system and start flight test.
- (U) Complete wind tunnel tests of innovative lift devices.
- (U) Fabricate SOF aerodynamic/propulsion system models.
- (U) Complete ICECS "g" load testing to evaluate performance.

(U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, WPAFB, OH. The top four contractors are Boeing, Seattle WA; McDonnell Douglas Aircraft Co., St Louis MO; Grumman Aerospace, Bethpage NY; and Canadian Commercial Corp, Ontario Canada.

(U) Related Activities:
(U) Program Element #0602201F, Aerospace Flight Dynamics
(U) Program Element #0602602F, Conventional Weapons Technology
(U) Program Element #0603245F, Adv Flight Technology Integration
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in thousands): Not Applicable

(U) International Cooperative Agreements: ICECS is 50% funded by the Canadian Government.

3. (U) Project 2978, Reliability and Maintainability: Designs and develops air vehicle technologies for improved reliability, maintainability and supportability (RM&S) while increasing performance, survivability and mission effectiveness. The Self-

Program Element: #0603205F Budget Activity: #2 - Advanced Technology Development
Title: Aerospace Vehicle Technology

Repairing Flight Control System (SRFCS) program develops reconfiguration methods for aerodynamic surfaces, and expert maintenance diagnostics for flight control systems. The adaptive Integrated Flight/Propulsion Control (IFPC) program extends reconfiguration control concepts to include the aircraft propulsion system, thrust vectoring, and low observable designs. The Integrated Environmentally Engineered Electronics (IEEE) program develops an approach to increase electronic component reliability by desensitizing the components to temperature and vibrations. The Aircraft Battle Damage Repair (ABDR) program develops field repairs for damaged aircraft to increase aircraft availability and sortie rates. The Vehicle Subsystem Integrity program (VSIP) develops design and assessment concepts to reduce the high failure rate of electro-mechanical aircraft subsystems.

(U) FY 1990 Accomplishments:
- (U) IEEE tested in a temperature and vibration facility.
- (U) Developed ABDR quick aircraft engine hydraulic/pressure lines, fuel controller, and engine casings field repair.

(U) FY 1991 Planned Program:
- (U) Complete SRFCS field maintenance diagnostic tests.
- (U) Compare IEEE electronic component test results with predictions to verify two-fold reliability improvement.

(U) FY 1992 Planned Program:
- (U) Transition SRFCS maintenance diagnostics to logistics units.
- (U) Conduct R&M design engineering for VSIP.
- (U) Start adaptive IFPC analysis phase to provide robust, low observable flight control using thrust vectoring.

(U) FY 1993 Planned Program:
- (U) Evaluate major vehicle subsystem failures for VSIP.
- (U) Complete ABDR highly composite aircraft repair methods.
- (U) Complete preliminary design of IFPC hardware/software.

(U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, WPAFB, OH. The top two contractors are Hughes Aircraft, Los Angeles CA; and Honeywell, Minneapolis MN.

(U) Related Activities:
(U) Program element #0602201F, Aerospace Flight Dynamics
(U) Program Element #0603106F, Logistics System Technology
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603205F
PE Title: Aerospace Vehicle Technology
Project Number: 3422
Budget Activity: #2-Advanced Technology Development

A. (U) RESOURCES: ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Integrated Control/Avionics Technology	10,463	12,721	10,285	6,343	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project develops aircraft advanced guidance/control and pilot/vehicle interface technology. Avionics technology (sensor data fusion, target detection identification and track algorithms, data links etc.) are utilized to improve aircraft combat engagement. The Integrated Control and Avionics for Air Superiority (ICAAS) program develops technologies to enable fighter aircraft to kill and survive when outnumbered in air combat; the targeted exchange ratio is 10:1. Focus is on optimum missile engagement beyond-visual-range (BVR) while minimizing enemy missile shot opportunities. To reduce development risk and provide interim products, simulation testing will begin with two-friendly-versus-eight-enemy (2vs8) aircraft engagements and build to more complex 4vs16 engagements. Program Element (PE) 0603205F work focuses on engineering design and multi-aircraft engagement ground simulation work. PE 0603245F integrates and validates ICAAS engagement/threat avoidance software developed in PE 0603205F through flight testing. Cockpit design efforts for special operations forces, transport, and tactical aircraft will address the problem of too much data, but not enough information for the pilots of future aircraft to successfully accomplish their mission at night, in adverse weather, and in a high threat environment. Cockpit efforts will integrate flat panel displays with graphic processors, and head-up/helmet mounted displays. The special operations forces and transport aircraft cockpit effort will address mission accomplishment with a reduced crew complement. The tactical aircraft cockpit effort will apply artificial intelligence technology (from DARPA's Pilot's Associate Program), and three dimensional audio with other cockpit technologies.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Developed ICAAS engagement specifications for two-friendly-versus-eight enemy (2vs8) aircraft simulation and 1vs4 flight test.
   - (U) Complete system design for ICAAS installation into F-15 test aircraft.

Program Element: #0603205F Project Number: 3422
Title: Aerospace Vehicle Technology Budget Activity: #2-Advanced Technology Development

2. (U) FY 1991 Planned Program:
   - (U) Complete ICAAS engineering design for 2vs8 internetted simulation.
   - (U) Develop detailed ICAAS simulation and flight test plans.
   - (U) Conduct ICAAS 2vs8 pilot in-the-loop internetted simulations.
   - (U) Complete in-house ICAAS mission environment simulation and crew station display format evaluations.

3. (U) FY 1992 Planned Program:
   - (U) Complete ICAAS engineering design for 4vs16 aircraft simulation.
   - (U) Define special operations forces, transport, and tactical aircraft cockpit mission requirements and concepts.

4. (U) FY 1993 Planned Program:
   - (U) Complete 4vs16 aircraft simulations and provide assessment of ICAAS benefits for multi-target engagements.
   - (U) Publish ICAAS program report containing requirements for an effective operational system.
   - (U) Complete special operations forces and transport aircraft crew station cockpit simulator build-up for concept evaluation.
   - (U) Complete simulator evaluation of candidate tactical aircraft cockpit.

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

D. (U) WORK PERFORMED BY: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright Patterson AFB, OH, which also conducts the in-house projects described. The prime contractor is McDonnell Douglas Co., St Louis MO.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:
   (U) TAF SON 310-85, Air Defense Aircraft, 7 Jan 86.
   (U) TAF SON 321-82, Dual Role Fighter, 5 Jan 84.
   (U) MAC SON 012-89, Advanced Theater Transport, draft.

G. (U) RELATED ACTIVITIES:
   (U) Program Element #0603230F, Advanced Tactical Fighter
   (U) Program Element #0603231F, Crew Systems and Personnel
   (U) Program Element #0603253F, Advanced Avionics Integration
   (U) Program Element #0603707E, Prototyping (Pilot's Associate Program)

Program Element: #0603205F Project Number: 3422
Title: Aerospace Vehicle Technology Budget Activity: #2-Advanced Technology Development

(U) Program Element #0603245F, Advanced Flight Technology Integration
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ in thousands): Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

	FY
1. (U) Start ICAAS two friendly vs eight enemy fighter (2vs8) simulation testing	3 Qtr 1991
2. (U) Complete in-house ICAAS Mission Environment simulation and crew station build-up	4 Qtr 1991
3. (U) Complete special operations forces and transport aircraft crew station cockpit simulator build-up	2 Qtr 1993
4. (U) Complete ICAAS 4vs16 piloted mission simulation	3 Qtr 1993
5. (U) Publish ICAAS report and transition technology	4 Qtr 1993
6. (U) Complete simulator evaluation of candidate tactical aircraft cockpit	4 Qtr 1993

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603211F Budget Activity: #2 - Adv Tech Dev
PE Title: Aerospace Structures

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
69CW Advanced Composites	8,245	9,299	10,258	10,560	Cont	TBD
486U Advanced Metallics	8,245	8,828	9,855	10,187	Cont	TBD
Total	16,490	18,127	20,113	20,747	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program demonstrates advanced structural design concepts using new/improved metallic (Project 486U) or nonmetallic (Project 69CW) materials. While metallics are generally strong, temperature resistant, and easy to manufacture, nonmetallics tend to be lighter, more durable, less observable, and more temperature resistant. Innovative structural concepts integrate these two types of materials with new design, manufacturing, and test techniques. The goal of this program element is to transition these technology benefits to all flight vehicle structures -- ranging from wings to canopies to engines. Funding increase to FY92/FY93 level reflects fabrication and test of two advanced-technology redesigned structures -- the C-130 Composite Center Wing Structure and the Advanced Technology Redesign of Highly Loaded Structures (ATROHS). These and other technology programs in this program element result in lighter, stronger, less maintenance intensive, more durable structures for current and future aerospace systems. This yields lower cost of ownership (by reducing acquisition, support, and maintenance costs), increased range (less structural weight means more fuel can be carried), improved sortie rates (due to durability and damage/threat tolerance and design for supportability), and reduced observability (both radar cross section and infrared emissions). These payoffs improve USAF capabilities in the areas of global force projection, hypersonics, and "kill and survive," with continuing emphasis placed on keeping technology affordable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603211F Project Number: 69CW
PE Title: Aerospace Structures Budget Activity: #2 - Adv Tech Dev

A. (U) RESOURCES ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Advanced Composites	8,245	9,299	10,258	10,560	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Develops and demonstrates advanced nonmetallic structures technology using fiber reinforced thermoset, thermoplastic, carbon-carbon, and ceramic materials. Demonstrates structural integration of smart vehicle technology including self-health monitoring, threat sensors and embedded avionics. These technology benefits are applied to all flight vehicle structures to provide enhanced survivability (reduced radar cross section, reduced infrared signature, increased damage tolerance), reduced weight, reduced acquisition cost, reduced ownership cost, and increased mission readiness for existing and future weapon systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Designed ceramic composite turbine engine 2-D nozzle sidewall to reduce radar signature of high temperature (2000°F) structures.
   - (U) Tested infrared signature attenuating structures for low observable aircraft applications.
   - (U) Fabricated subelement test specimens of 3-D woven carbon-carbon structures for application to hypersonic vehicles.
   - (U) Completed preliminary design review of Mission Integrated Transparency System Program (MITS).

2. (U) FY 1991 Planned Program:
   - (U) Flight demonstrate A-10 thermoplastic trailing edge flap.
   - (U) Proof test ceramic composite turbine engine 2-D nozzle sidewall, leading to engine test in FY 1992.
   - (U) Fabricate and test full-scale low-infrared-observable structures component.
   - (U) Ground test carbon-carbon 2-D nozzle convergent flap on an Advanced Tactical Fighter Engine.
   - (U) Fabricate the major test component for the carbon-carbon hypersonic primary structures program.

3. (U) FY 1992 Planned Program:
   - (U) Develop and validate design methods to reduce the cost of composite structures, in a joint program with the Manufacturing Technology Directorate. Overall objective is to reduce manufacturing costs by 50% and maintenance costs by 25%.

Program Element: #0603211F Project Number: 69CW
Title: Aerospace Structures Budget Activity: #2 - Adv Tech Devel

- (U) Engine test ceramic composite turbine engine 2-D nozzle sidewall to demonstrate radar signature attenuation and weight savings.
- (U) Test 3-D woven carbon-carbon hypersonic primary structure.
- (U) Develop designs for radar absorbing structures which will significantly reduce inspection and maintenance costs relative to current low observable aircraft.
- (U) Develop a lightweight, durable C-130 composite center wing structure to triple the life and increase the range for special operations missions (avoids the weight penalty of conventionally strengthened metallic structures).
- (U) Design and develop ultralightweight low observable structures for elevated temperature (700°F) applications.
- (U) Fabricate MITS transparency system.
- (U) Ground test thermoplastic fuselage full-scale components for supersonic (high temperature) applications.

4. (U) FY 1993 Planned Program:
   - (U) Demonstrate concurrent design/manufacturing engineering methods to reduce manufacturing and ownership costs.
   - (U) Fabricate full-scale demonstration component for C-130 center wing structure development program.
   - (U) Complete testing of Mission Integrated Transparency System (MITS) for future tactical aircraft to improve supportability, fuselage integration, man-machine interfaces (heads-up displays, crew ingress/egress), and survivability (combat, chemical, nuclear, laser, birdstrike, biological).
   - (U) Conduct tests of radar absorbing structural components to validate inspection and maintenance cost savings benefits achieved with advanced designs.
   - (U) Fabricate ultralightweight low observable structural components for radar signature testing.

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

D. (U) WORK PERFORMED BY: This project is managed by the Flight Dynamics Directorate of Wright Laboratory, Wright-Patterson AFB OH. The major contractors include: Lockheed Aeronautical Systems Company, Los Angeles CA; Northrop Corporation, Hawthorne CA; General Dynamics Corporation, Ft Worth TX; Boeing Aerospace Company, Wichita KS; and Pratt & Whitney, West Palm Beach FL.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) Technical Changes: None.
2. (U) Schedule Changes: Delayed flight demonstration of A-10 thermoplastic flap to FY 1991; delayed Mission Integrated Transparency System (MITS) fabrication to FY 1992 and MITS test to FY 1993.

Program Element: #0603211F
Title: Aerospace Structures
Project Number: 69CW
Budget Activity: #2 - Adv Tech Devel

3. (U) Cost Changes: None.

F. (U) PROGRAM DOCUMENTATION:
(U) MAC SON 001-89 Theater Airlift Enhancement (Draft).
(U) SAC SON 002-86 Improved Interceptor (Draft).
(U) TAF SON 310-85 Air Defense Aircraft, 7 Jan 86.
(U) TAF SON 321-82 Dual Role Fighter, 5 Jan 84.

G. (U) RELATED ACTIVITIES:
(U) Program Element #602102F, Materials.
(U) Program Element #602201F, Aerospace Flight Dynamics.
(U) Program Element #603112F, Advanced Materials for Weapon Systems.
(U) Program Element #603224C, Survivability, Lethality, and Key Technologies.
(U) Program Element #603205F, Aerospace Vehicle Technology.
(U) Program Element #603245F, Advanced Flight Technology Integration.
(U) Program Element #604212F, Aircraft Equipment Development.
(U) Program Element #708011F, Air Force Manufacturing Technology Program.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands): Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

1. (U)	Flight Test of A-10 Thermoplastic Flap	3rd Qtr FY 1991
2. (U)	Carbon-Carbon 2-D Nozzle Component Advanced Tactical Fighter Engine Test	4th Qtr FY 1991
3. (U)	Airframe Infrared Attenuation Demonstration	4th Qtr FY 1991
4. (U)	Design C-130 Composite Center Wing Structure	2nd Qtr FY 1992
5. (U)	Structural Test Thermoplastic Primary Structure Component	2nd Qtr FY 1992
6. (U)	Test Carbon-Carbon Hypersonic Vehicle Primary Structure	3rd Qtr FY 1992
7. (U)	Ceramic Composite Component Engine Test	3rd Qtr FY 1992
8. (U)	Supportable Radar Absorbing Structure Validation Test	2nd Qtr FY 1993
9. (U)	Fabricate C-130 Composite Center Wing Structure	3rd Qtr FY 1993
10. (U)	Mission Integrated Transparency System (MITS) Demonstration Test	3rd Qtr FY 1993

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603211F Project Number: 486U
PE Title: Aerospace Structures Budget Activity: #2 - Adv Tech Dev

A. (U) RESOURCES ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Advanced Metallics	8,245	8,828	9,855	10,187	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
This project develops and demonstrates new metallic structures technology using metal matrix composites (MMC), rapidly solidified metal powders, advanced aluminum alloys, and advanced damping materials. These are used in developing innovative design concepts which will significantly reducing the weight and life cycle cost of present and future flight vehicles. This project transitions these technologies to fielded and future flight vehicle structures to yield greater reliability, resistance to hostile environments (ballistic/ laser damage, birdstrikes, etc.), and lower cost of ownership.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Developed new fuselage design concept based primarily on affordability and maintainability.
   - (U) Transferred damped structures technology for A-10 engine inlet rings to save $10M in maintenance costs for operational fleet.
   - (U) Initiated development of 1250°F MMC bladed compressor rotor (current advanced jet engines are limited to 1100°F).
   - (U) Fabricated titanium matrix composite horizontal stabilizers for verification testing.

2. (U) FY 1991 Planned Program:
   - (U) Complete ground testing of MMC fighter vertical stabilizers to demonstrate weight and strength advantages over current metals.
   - (U) Fabricate and test low observable (infrared attenuating) aluminum-lithium airframe subcomponent.
   - (U) Fabricate elevated temperature aluminum structures.

3. (U) FY 1992 Planned Program:
   - (U) Select representative primary structure to demonstrate application of advanced structures technology to hypersonic vehicles for military missions.
   - (U) Redesign representative aircraft primary structure (eg. wing, tail) to demonstrate affordable options for applying Advanced Technology Redesign of Highly Loaded Structure (ATROHS) to keep aging aircraft flying.
   - (U) Analyze aircraft high energy laser survivability and vulnerability.

Program Element: #0603211F
Title: Aerospace Structures
Project Number: 486U
Budget Activity: #2 - Adv Tech Devel

- (U) Complete ground testing and evaluation of new fuselage concept ("hybrid fighter structure") and transition to advanced aircraft programs.
- (U) Complete ground test and evaluation of elevated temperature aluminum structural demonstration components as alternative to titanium for fighter aircraft applications (aluminum is 50% less expensive than titanium).

4. (U) FY 1993 Planned Program:
   - (U) Design advanced structure for military hypersonic vehicle.
   - (U) Fabricate & test Advanced Technology Redesign of Highly Loaded Structure (ATROHS).
   - (U) Test a representative aircraft structure for high energy laser survivability and vulnerability.
   - (U) Investigate new structural airframe designs applicable to future transport, special operations forces, and tactical aircraft.
   - (U) Develop durable structures for applications where aft surfaces are exposed to hot exhaust and damaging acoustics.
   - (U) Fabricate & test lightweight titanium metal matrix composite (MMC) turbine engine disk.

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

D. (U) WORK PERFORMED BY: This project is managed by the Flight Dynamics Directorate of Wright Laboratory, Wright-Patterson AFB OH. The major contractors include: Lockheed Aeronautical Systems Company, Atlanta GA; McDonnell Douglas Corporation, St Louis MO; LTV Corporation, Dallas TX; General Dynamics Corporation, Fort Worth TX; and Pratt & Whitney, West Palm Beach FL.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) Technical Changes: Deleted Rapid Solidification Technology and Ultralightweight Airframe programs.
2. (U) Schedule Changes: Delayed fabrication of elevated temperature aluminum structures and test of MMC vertical stabilizers from FY 1990 to FY 1991. Delayed completion of Supportable Hybrid Fighter Structural Demonstration from FY 1991 to FY 1992.
3. (U) Cost Changes: None.

F. (U) PROGRAM DOCUMENTATION:
   (U) MAC SON 001-89 Theater Airlift Enhancement (Draft).
   (U) SAC SON 002-86 Improved Interceptor (Draft).
   (U) TAF SON 310-85 Air Defense Aircraft, 7 Jan 86.
   (U) TAF SON 321-82 Dual Role Fighter, 5 Jan 84.

Program Element: #0603211F Project Number: 486U
Title: Aerospace Structures Budget Activity: #2 - Adv Tech Devel

G. (U) RELATED ACTIVITIES:
(U) Program Element #602102F, Materials.
(U) Program Element #602201F, Aerospace Flight Dynamics.
(U) Program Element #603112F, Advanced Materials for Weapon Systems.
(U) Program Element #603224C, Survivability, Lethality, and Key Technologies.
(U) Program Element #603205F, Aerospace Vehicle Technology.
(U) Program Element #603245F, Advanced Flight Technology Integration.
(U) Program Element #604212F, Aircraft Equipment Development.
(U) Program Element #708011F, Air Force Manufacturing Technology Program.
(U) Tri-Service Metal Matrix Composite (MMC) Steering Group.
(U) Tri-Service Laser Hardened Materials and Structures Steering Group
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands): Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: International funds are applied to the Structural Improvement of Operational Aircraft contract.

J. (U) MILESTONE SCHEDULE:

1. (U)	Aluminum Metal Matrix Composite (MMC) Vertical Stabilator Demonstrations	2nd Qtr FY 1991
2. (U)	Aircraft Structure High Energy Laser Vulnerability Analysis	2nd Qtr FY 1992
3. (U)	Initiate Fabrication of Advanced Technology Redesign of Highly Loaded Structure (ATROHS)	2nd Qtr FY 1992
4. (U)	Supportable Hybrid Fighter Structural Demonstration	2nd Qtr FY 1992
5. (U)	Elevated Temperature Aluminum Structure Demonstration	3rd Qtr FY 1992
6. (U)	Test ATROHS Structure	2nd Qtr FY 1993
7. (U)	MMC Turbine Engine Disk Validation	2nd Qtr FY 1993
8. (U)	Aircraft Structure High Energy Laser Vulnerability Test	4th Qtr FY 1993
9. (U)	Preliminary Design of Hypersonic Vehicle Component	4th Qtr FY 1993

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603216F
PE Title: Aerospace Propulsion and Power Technology

Budget Activity: #2 - Adv Technology Development

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2480 Aviation Turbine Fuel Technology*	0	1,000	1,000	1,532	Cont	TBD
2697 Atmospheric Propulsion Concepts	4,499	7,631	8,854	5,876	Cont	TBD
3035 Aircraft Power Systems	2,513	3,936	3,090	3,018	Cont	TBD
3036 Battery Technology	472	300	1,000	650	Cont	TBD
681B Advanced Turbine Engine Gas Generator (ATEGG)	23,744	21,731	28,113	32,027	Cont	TBD
TOTAL	31,228	34,598	42,057	43,103	Cont	TBD

* Project 2480 funding is exclusively for the demonstration of advanced, endothermic/thermally stable fuel technology, transitioning from PE 0602203F.

B. (U) BRIEF DESCRIPTION OF ELEMENT: These projects ensure continuous development and demonstration of turbine engine high pressure core components, advanced airbreathing engine concepts, high heat sink and thermally stable fuels, and power technology for aerospace vehicles. Anticipated technology payoffs include 35 - 60% reduction in aircraft takeoff gross weight and more than 100% range increase compared to state-of-the-art technology; a 50% or more increase in missile average and terminal velocity for enhanced lethality; higher temperature fuels for propulsion and thermal management; -65 F cold weather engine starting; and "more electric aircraft" power components projected to have up to 400% improved reliability, 20% reduction in weight of aircraft power systems, and enhanced survivability.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2480, Aviation Turbine Fuel Technology: Investigates fuel sources to minimize cost and ensure continuous aviation fuel deliveries to the Air Force. Develops new hydro-carbon fuels with high heat absorbing capability (endothermic) and high thermal stability (JP fuels) for future aircraft. High heat sink fuels are required to absorb the large amounts of waste heat generated by aircraft subsystems, propulsion systems, and aerodynamic heating.

(U) FY 1990 Accomplishments:
- (U) First generation endothermic fuel work concluded in FY89 with project zero funded in FY90 due to fiscal constraints.

(U) FY 1991 Planned Program:
- (U) Initiate second generation endothermic fuel program with higher cooling capability liquids, more efficient catalysts,

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Title: Aerospace Propulsion and Power Technology

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and a more compact heat exchanger/reactor design.

(U) FY 1992 Planned Program:
- (U) Rig test a second generation endothermic fuel heat exchanger/reactor. This is a key enabling technology for future manned/unmanned Mach 4-6 vehicles.

(U) FY 1993 Planned Program:
- (U) Complete rig testing of second generation endothermic fuel heat exchanger/reactor. Transition technology to AF/NASA High Mach Turbine Engine (HiMaTE) program.
- (U) Validate high thermally stable JP8+100 with an Integrated High Performance Turbine Engine Technology (IHPTET) experimental turbine engine demonstration.

(U) Work Performed By: Project managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson Air Force Base, OH. Fuel research will be contracted via competitive procurement.

(U) Related Activities:
(U) Program Element #0602203F, (Aerospace Propulsion).
(U) Coordination with Army, Navy, DARPA, NASA, Department of Energy, industry, and academia is accomplished by joint projects and the DOD Mobility Fuels Committee.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriated Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2697, Atmospheric Propulsion Concepts: Provides assessment and demonstration of the airbreathing, Variable Flow Ducted Rocket (VFDR). The VFDR is an improved propulsion option for the Advanced Medium Range Air to Air Missile (AMRAAM) Pre-Planned Product Improvement (P^3I) program. The VFDR program scope was substantially expanded to support technology transition to AMRAAM P^3I in FY93.

(U) FY 1990 Accomplishments:
- (U) Selected booster propellant for VFDR and initiated environmental and performance testing.
- (U) Tested an alternate fuel for the VFDR gas generator that successfully reduced plume visibility.

(U) FY 1991 Planned Program:
- (U) Complete booster development testing demonstrating flight weight, total impulse, grain configuration, and burn rate.
- (U) Complete gas generator development testing demonstrating low signature exhaust, throttle control, fuel flow rate, and integrated guidance/fuel control valve.
- (U) Continue the engine performance tests to determine engine efficiency, durability and ramjet operability.

(U) FY 1992 Planned Program:
- (U) Initiate and complete booster and gas generator testing at simulated environmental/flight conditions.

Program Element: #0603216F
Title: Aerospace Propulsion and Power Technology

Budget Activity: #2 - Adv Technology Development

- (U) Establish gas generator and booster final design.
- (U) Initiate freejet testing at Arnold Engineering Development Center (AEDC) to simulate/verify integrated ramjet propulsion and missile design.
- (U) Initiate Preliminary Flight Rating Testing (PFRT) to demonstrate acceptable performance for future flight tests.

(U) FY 1993 Planned Program:
- (U) Complete freejet testing at AEDC to verify the aerodynamic performance (pitch, yaw, bank-to-turn) of the integrated ramjet propulsion and missile design.
- (U) Conduct ground tests to verify proper mission sequencing of key propulsion system components.
- (U) Flightworthy VFDR technology ready for AMRAAM P^{3}I (full scale development and flight testing).

(U) Work Performed By: Project managed by Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson Air Force Base, OH. The contractor team includes: Atlantic Research Corporation, Gainesville, VA, and Hercules Inc, McGregor, TX with subcontracts at Hughes Aircraft Company, Tucson AZ, and Quantic, San Carlos, CA.

(U) Related Activities:
- (U) Program Element #0602203F, (Aerospace Propulsion)
- (U) Program Element #0602102F, (Materials)
- (U) Program Element #0602201F, (Aerospace Flight Dynamics)
- (U) The Joint Army-Navy-NASA-Air Force (JANNAF) Propulsion Committee coordinates efforts to provide non-duplicative options for future missiles systems.
- (U) No duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3035, Aircraft Power Systems: Develops and demonstrates aircraft power systems such as hydraulics, engine starters, auxiliary power units (APU), and electrical power distribution systems. The principle focus of this project is the "more electric aircraft" concept aimed at improving reliability and weight savings of aircraft power systems by replacing fluid-powered (hydraulics and bleed air) accessories with electrically-powered systems.

(U) FY 1990 Accomplishments:
- (U) Completed 8000 psi nonflammable hydraulic fluid test, demonstrating technology for improved safety of advanced, lightweight, high pressure hydraulic systems.
- (U) Tested advanced engine starter vane with materials essential to acceptable life in -65 F starting conditions.

(U) FY 1991 Planned Program:
- (U) Initiate aircraft electrical power distribution program to demonstrate feasibility of a fault tolerant power system for the "more electric aircraft" concept.
- (U) Rig test first generation fast acting power switch for high reliability generators, offering 50% increased power output

Program Element: #0603216F
Title: Aerospace Propulsion and Power Technology

Budget Activity: #2 - Adv Technology Development

with double the reliability. Joint program with the Navy.

(U) FY 1992 Planned Program:
- (U) Performance test of an engine starter from -65 F to 130 F to demonstrate 500 simulated starts without refurbishment.
- (U) Complete preliminary designs of "more electric aircraft" electric power distribution subsystem.
- (U) Transfer high reliability generator to Navy for testing under joint agreement.

(U) FY 1993 Planned Program:
- (U) Fabricate key components for the "more electric aircraft" power distribution system demonstrator.
- (U) Test 270 Volt dc, solid state high power switching & load management components for possible retrofit of electric actuators on the C-141, "Electric Starlifter" program.
- (U) Test integral engine starter/generator concept. This will provide capability to eliminate engine and airframe gearboxes that total over 300 pounds on the F-16.

(U) Work Performed By: Project managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson Air Force Base, OH. The contractors are McDonnell Aircraft Co, St Louis, MO; General Dynamics Co, Fort Worth, TX; General Electric, Schenectady, NY and Evandale, OH.

(U) Related Activities:
(U) Program Element #0602203F, (Aerospace Propulsion)
(U) Program Element #0602102F, (Materials)
(U) Program Element #0602201F, (Aerospace Flight Dynamics)
(U) Program Element #0603203F, (Aerospace Flight Dynamics)
(U) Project coordinated with US Army, US Navy, and NASA.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 3036, Battery Technology: Develops aircraft and missile batteries to provide higher energy density with improved life. Currently developing a 20 year maintenance free battery concept that will transition to the Joint Surveillance Tracking And Relay System (Joint STARS) program.

(U) FY 1990 Accomplishments:
- (U) Completed tests and transitioned thermal battery technology for Advanced Medium Range Air to Air Missile (AMRAAM) and Small Intercontinental Ballistic Missile (SICBM) applications.

(U) FY 1991 Planned Program:
- (U) Initiate a maintenance free battery effort offering 20 year life and $500 million life cycle cost savings Air Force wide.

(U) FY 1992 Planned Program:
- (U) Develop a "smart charger" with a micro processor control to optimize battery charging and increase battery life.
- (U) Develop and bench test battery cells with high endurance electrodes and hermetically sealed electrolyte.

Program Element: #0603216F
Title: Aerospace Propulsion and Power Technology

Budget Activity: #2 - Adv Technology Development

(U) FY 1993 Planned Program:
- (U) Full-up development test of maintenance free battery and "smart charger" in preparation for flight tests by the Joint STARS program office in FY 94.

(U) Work Performed By: Project managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson Air Force Base, OH. The contractors will be selected by competitive procurement.

(U) Related Activities:
(U) Program Element #0602203F, (Aerospace Propulsion)
(U) Program Element #0602102F, (Materials)
(U) Program Element #0602201F, (Aerospace Flight Dynamics)
(U) Program Element #0603203F, (Aerospace Flight Dynamics)
(U) Project coordinated with US Army, US Navy, and NASA.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603216F
PE Title: Aerospace Propulsion and Power Technology
Project Number: 681B
Budget Activity: #2 - Adv Technology Development

A. (U) RESOURCES ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
ATEGG	23,744	21,731	28,323*	31,511*	Cont	TBD

* Funding increase needed to complete IHPTET Phase I testing and to design and build new experimental core engines for IHPTET Phase II.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Ensures turbine engine gas generator technology is available to meet the requirements of future aircraft propulsion systems. The objective is to provide the continued evolution of technologies into an advanced gas generator in which the performance, cost, and durability aspects can be assessed in a real engine environment. The gas generator, or core, is the basic building block of the engine and it consists of a compressor, a combustor, and a high pressure turbine that powers the compressor. Experimental core engine testing enhances early, low risk transition of key engine technologies into engineering development where they can be applied to derivative and/or new systems. The technologies are applicable to a large range of potential systems applications. This project supports the Integrated High Performance Turbine Engine Technology (IHPTET) initiative. IHPTET is a three phase, totally integrated DOD, DARPA, NASA, and industry effort focused on doubling turbine engine propulsion capabilities (over the ATF engine) by the year 2005. Each IHPTET phase accomplishes one third of the final goal while transitioning interim technology to new/current weapon systems during the program.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Demonstrated an IHPTET Phase I advanced turbojet/turbofan core with an overall 20% increase in thrust-to-weight and a 20% reduction in specific fuel consumption.
   - (U) Fabricated and tested a lamilloy combustor demonstrating a 50% reduction in cooling requirements and a 10% increase in thrust.
   - (U) Initiated design and fabrication of IHPTET Phase I core hardware components for Joint Turbine Advanced Gas Generator (JTAGG) turboprop/turboshaft demonstrator.

2. (U) FY 1991 Planned Program:
   - (U) Design and initiate fabrication of IHPTET Phase II turbojet/turbofan core gas generator. Goals are a 60% improvement in thrust-to-weight with a 32% improvement in fuel consumption.
   - (U) Test Allison IHPTET Phase I ATEGG with improved compressors using first ever metal matrix rotor and single support rotors to achieve a 10% speed increase and a 10% reduction in rotor weight.
   - (U) Initiate test of Pratt IHPTET Phase I ATEGG with full life, advanced heat transfer turbine blades with a plus 300 F inlet temperature capability over ATF.

Program Element: #0603216F
Title: Aerospace Propulsion and Power Technology

Project Number: 681B
Budget Activity: #2 - Adv Technology Development

3. (U) FY 1992 Planned Program:
   - (U) Complete testing of IHPTET Phase I Joint Technology Advance Gas Generator (JTAGG) to provide 20% reduced specific fuel consumption and 40% power-to-weight improvement for turboprop engine cores.
   - (U) Complete performance demonstration of Pratt IHPTET Phase I ATEGG with an overall 30% increase in thrust-to-weight.
   - (U) Fabricate Allison IHPTET Phase II dual annular lamilloy combustor that increases temperature capability by 500 F over baseline.
   - (U) Fabricate Allison IHPTET Phase II all metal matrix composite compressor yielding 25% improvement in performance.
   - (U) Fabricate Pratt IHPTET Phase II high work turbine with a 500 F increase in rotor inlet temperature capability.
   - (U) Initiate JTAGG IHPTET Phase II testing at Lycoming. Goals are a 30% reduction in specific fuel consumption and an 80% power-to-weight improvement by 1997.

4. (U) FY 1993 Planned Program:
   - (U) Perform structural and life assessment on an IHPTET Phase I ATEGG core to demonstrate equivalent ATF engine life.
   - (U) Assemble and instrument Allison IHPTET Phase II compressors using metal matrix rotor structures providing a 40% weight reduction.
   - (U) Assemble and instrument Pratt IHPTET Phase II axial staged combustors reducing cooling air requirement by 70% and length by 20%.
   - (U) Assemble and instrument Pratt IHPTET Phase II high work turbine design with cooling schemes that provide a 500 F temperature improvement with a corresponding 3% reduction in blade cooling.
   - (U) Continue JTAGG IHPTET Phase II testing demonstrating a 25% reduction in specific fuel consumption and a 60% power-to-weight improvement.

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

D. (U) WORK PERFORMED BY: The program is managed by the Aero Propulsion and Power Directorate, Wright Laboratories, Wright-Patterson AFB, OH. Contractors involved in this effort are: General Electric, Evendale, OH; Pratt and Whitney, West Palm Beach, FL; Garrett Engine Division, Phoenix, AZ; Allison Gas Turbine Division, Indianapolis, IN; and Textron Lycoming, Stratford, CT.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Terminated one contractor's IHPTET Phase I effort due to FY91 funding reduction, increasing the risk of JTAGG program.
2. (U) SCHEDULE CHANGES: Completion of IHPTET Phase I JTAGG testing slipped from FY91 to FY92. Initiation of IHPTET Phase II turbojet/turbofan core engine testing slipped from FY93 to FY94.
3. (U) COST CHANGES: Budget constraints require program stretch-out which will likely increase the cost of IHPTET Phase II by 5 to 8%.

F. (U) PROGRAM DOCUMENTATION: Program is documented with technical reports, papers, and presentations.

Program Element: #0603216F
Title: Aerospace Propulsion and Power Technology

Project Number: 681B
Budget Activity: #2 - Adv Technology Development

G. (U) RELATED ACTIVITIES:
- (U) PE 0602203F (Aerospace Propulsion)
- (U) PE 0602102F (Materials)
- (U) PE 0602201F (Aerospace Flight Dynamics)
- (U) PE 0603202F (Advanced Propulsion System Integration)
- (U) PE 0603211F (Aerospace Structures and Materials)
- (U) PE 0708911F (Manufacturing Technology)
- (U) Complementary development efforts by both the Navy (PE 0602122N and PE 0603210N) and Army (PE 0603003A).
- (U) Part of DOD Integrated High Performance Turbine Engine Technology (IHPTET) initiative that combines efforts of Air Force, Navy, Army, DARPA, and NASA in advanced aerodynamics, materials, and innovative design capability. The goal of IHPTET is to demonstrate minimum weight, high core power engine technology that offers at least 100% improvement over state-of-the-art technology by the year 2005.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1.	(U) Completed testing of GE IHPTET Phase I ATEGG build 2	Apr 1990
2.	(U) Begin testing of Pratt IHPTET Phase I ATEGG build 2	Nov 1990
3.	(U) Begin testing of Lycoming IHPTET Phase I JTAGG	Apr 1991
4.	(U) Begin testing of GE/Garret IHPTET Phase I JTAGG	Sep 1991
5.	(U) Begin testing of Allison IHPTET Phase I ATEGG	Aug 1991
6.	(U) Complete testing of GE/Garret IHPTET Phase I JTAGG	OCT 1991
7.	(U) Complete testing of Lycoming IHPTET Phase I JTAGG	Nov 1991
8.	(U) Begin testing of Lycoming IHPTET Phase II JTAGG	Jan 1992
9.	(U) Begin testing of Pratt IHPTET Phase I ATEGG build 3	Apr 1992
10.	(U) Begin testing of GE/Garret IHPTET Phase II JTAGG	Jul 1992
11.	(U) Begin IHPTET Phase I structural ATEGG demonstration test	Sep 1993
12.	(U) Begin testing of Pratt IHPTET Phase II ATEGG	Dec 1993
13.	(U) Begin testing of Allison IHPTET Phase II ATEGG	Apr 1994

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603227F Budget Activity: #2 - Adv Technology Dev
PE Title: Personnel, Training, and Simulation Technology

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2743 Multi-Ship Training Research and Development	3,791	4,206	5,719	6,022	Cont	TBD
2922 Manpower and Force Management	935	1,382	1,725	1,317	Cont	TBD
2949 Advanced Training Technology	2,416	2,386	2,057	2,650	Cont	TBD
Total	7,142	7,974	9,501	9,989	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Demonstrates concepts to improve operational readiness and combat training through the development of manpower, personnel and training (MPT) technologies including: systems to write computer-based training programs; decision aiding systems to optimize personnel use; job performance measurement technologies; analytical tools to improve consideration of manpower, personnel and training in the system design process and technologies to enable realistic, small- or large-scale aircrew combat training. Most technologies demonstrated in this Program Element (PE) transition into full-scale development (6.4) program elements; however, some transition directly to field users.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2743, Multi-Ship Aircrew Training Research and Development: This project will develop, demonstrate and evaluate simulator-based air combat training as an affordable, effective, and realistic adjunct to flight-based training. Provides a testbed for examining aircrew skills, cognitive functions, behaviors, and instructional strategies that contribute to success in combat. Different levels of simulator fidelity will provide data to determine the most cost-effective levels for combat training. Long distance networking will enable Joint-Service/combined arms training. Technologies successfully demonstrated in this project will be transitioned into full scale engineering development programs such as new "helmet-mounted" flight simulators which are more cost effective than current models.

(U) FY 1990 Accomplishments:
- (U) Transitioned the Air-Intercept-Trainer to an F-16 Air National Guard unit; used to augment the unit's training in Desert Storm.
- (U) Installed a prototype full-field-of-view dome display system to increase visual system fidelity.
- (U) Evaluated an eye tracked system for the fiber optic helmet-

mounted display (FOHMD) to provide increased resolution.

(U) FY 1991 Planned Program:
- (U) Enhance image resolution of the FOHMD to provide a high fidelity visual system for air-to-ground training.
- (U) Demonstrate low cost helmet-mounted display (HMD) technology for application to squadron level training.
- (U) Validate the full-field of view dome training technology.

(U) FY 1992 Planned Program:
- (U) Demonstrate low-cost color liquid crystal display helmet-mounted display technology for squadron level training.
- (U) Demonstrate eye tracking technology that can be retrofited to existing simulators to provide high fidelity visual systems for air-to-ground training.
- (U) Demonstrate networked combat engagement trainers for low-cost, high fidelity air-to-air training.

(U) FY 1993 Planned Program:
- (U) Validate operational training transfer achievable using the simulator-based air-to-ground training technology for single-ship and multi-ship operations.
- (U) Develop air-to-ground simulation training guidelines to assist in requirements definition.
- (U) Demonstrate networked trainers at squadron level for air-air mission rehearsal between different AF bases.

(U) Work Performed By: Program managed by the Armstrong Laboratory, Williams AFB AZ. The three prime contractors are: University of Dayton, Dayton OH; McDonnell Douglas, St Louis MO; and General Electric Corporation, Daytona Beach FL.

(U) Related Activities:
- (U) PE 0602205F, Personnel, Training, and Simulation.
- (U) PE 0604227F, Flight Simulator Development.
- (U) The AF has formal agreements with the Army for visual display and computer image generation technology.
- (U) The Navy has a liaison office at Armstrong Laboratory.
- (U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: US and Canada are developing a Fiber Optics Helmet-Mounted Display system for flight simulators.

2. (U) Project 2922, Manpower and Force Management: Manpower, personnel, and training (MPT) factors impact the day-to-day productivity of the force as well as the ability to operate, maintain and support mission-capable weapon systems. This project develops technology and methods to enhance the consideration of MPT factors early in the weapon system design and acquisition process to ensure MPT

Program Element: #0603227F Budget Activity: #2 - Adv Technology Dev
PE Title: Personnel, Training, and Simulation Technology

requirements are supportable, and to enable trade-offs to accommodate MPT limitations and costs. Develops methods to link job performance and enlistment standards; determines the effect of MPT factors in productivity. Timely consideration of these factors will reduce a weapon systems development and life-cycle costs.

(U) FY 1990 Accomplishments:
- (U) Developed preliminary automated procedures for clustering tasks into efficient jobs or training modules.
- (U) Demonstrated the effectiveness of biographical data to augment current selection and classification measures.

(U) FY 1991 Planned Program:
- (U) Determine relationship of AF enlistment standards to on-the-job performance.
- (U) Develop a technology analysis system to link MPT tools and databases which will provide necessary, user friendly information to weapon system designers.

(U) FY 1992 Planned Program:
- (U) Establish measures of effectiveness for use in evaluating MPT tools and techniques.
- (U) Complete Phase III of the leadership effectiveness assessment profile (LEAP): validation and analysis.
- (U) Establish linkage of manpower, personnel and training (MPT) databases.

(U) FY 1993 Planned Program:
- (U) Transfer procedures for collecting task-level job knowledge requirements to USAF Occupational Measurement Squadron.
- (U) Complete productive capacity model for linking enlistment standards to job performance for AF Military Personnel Center.

(U) Work Performed By: Program managed by the Armstrong Laboratory, Brooks AFB TX. The three prime contractors are: Operational Tech Corp., San Antonio TX; Metrica Inc., Bryan TX; and University Energy Systems, Dayton OH.

(U) Related Activities:
(U) PE 0602205F, Personnel, Training, and Simulation.
(U) PE 0604243F, Manpower, Personnel, and Training Dev.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2949, Advanced Training Technologies: Modern high technology systems have relieved maintenance technicians from performing many of the routine diagnostic and repair tasks, making it difficult to obtain necessary job experiences for growth from

Program Element: #0603227F Budget Activity: #2 - Adv Technology Dev
PE Title: Personnel, Training, and Simulation Technology

novice to expert. This project develops computer-based training systems to replace that lost experience. Develops guidelines and specifications for the most cost effective and efficient application to Air Force training environments. Develops and demonstrates software to enable AF training developers to rapidly and inexpensively build Intelligent Computer-Assisted Training (ICAT) systems. ICAT systems continually evaluate and interact with the student to deliver effective individualized training.

(U) FY 1990 Accomplishments:
- (U) Developed the Mechanical Job Family Trainer for F-15 mechanics, hydraulic specialists, and crew chiefs.
- (U) Demonstrated an ICAT rapid prototyping capability for evaluating ICAT designs and applications.

(U) FY 1991 Planned Program:
- (U) Determine hardware and software requirements for cost effective and user friendly ICAT development.
- (U) Determine which instructional strategies provide the best training in ICAT applications.
- (U) Demonstrate microcomputer authoring techniques for rapid development of intelligent tutors.
- (U) Initiate development of the Mechanical Job Family Tutor.

(U) FY 1992 Planned Program:
- (U) Develop the first version of Rapid Intelligent Tutoring System (ITS) Development Systems (RIDES) software.
- (U) Initiate evaluation of the Avionics Job Family Tutor.
- (U) Initiate in-house evaluation of RIDES.
- (U) Expand initial Mechanical Job Family Tutor.

(U) FY 1993 Planned Program:
- (U) Complete evaluation of Avionics Job Family Tutor.
- (U) Initiate evaluation of Mechanical Job Family Tutor.
- (U) Complete development of the RIDES.
- (U) Initiate field demonstration, test, and evaluation of RIDES.

(U) Work Performed By: Program is managed by the Armstrong Laboratory, Brooks AFB TX. The two prime contractors are: Metrica Inc., Bryan TX and University of Southern California, Los Angeles CA.

(U) Related Activities:
(U) PE 0602205F, Personnel, Training, and Simulation.
(U) PE 0604243F, Manpower, Personnel, and Training Dev.
(U) The AF has formal agreements with the Army and Navy to share CAT technologies.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992 1993 Biennial RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0603230F
PE Title: Advanced Tactical Fighter (ATF)

Budget Activity: # 4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Estimate	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2472 Advanced Tactical Fighter	450,875	331,795	0	0	0	1,136,353
2878 Advanced Tactical Fighter Engine	293,677	395,567	0	0	0	1,872,772
2995 Critical Subsystems Development	286,584	29,705	0	0	0	536,089
Total	1,031,136	757,067	0	0	0	3,545,214

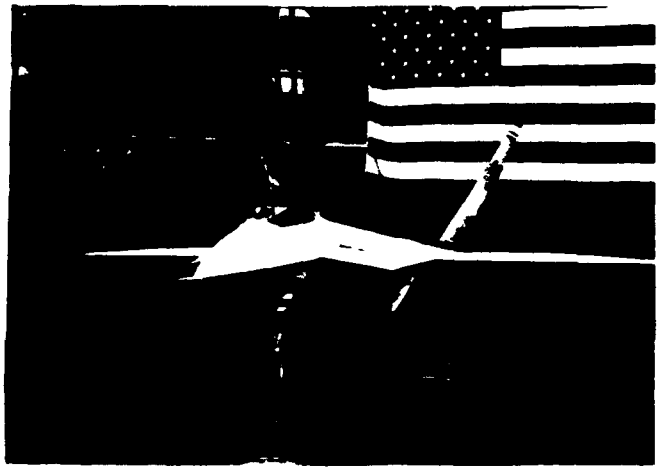
B. (U) BRIEF DESCRIPTION OF ELEMENT: The Advanced Tactical Fighter (ATF)program will develop the next generation air superiority fighter for introduction in the late-1990s to counter the emergence of large numbers of advanced Soviet fighters. The ATF is being designed to penetrate enemy airspace and achieve a first-look, first-kill capability against multiple targets. Program emphasis from the outset has been balanced on affordability, performance, survivability, and reliability/maintain ability. To develop and mature the advanced concepts and technologies required in this next-generation fighter prior to its entering Full-Scale Development (FSD), intensive hardware demonstrations and risk reduction efforts will be accomplished in a 54-month Demonstration/Validation (Dem/Val)(Prototype) phase. The Dem/Val phase has been structured to incorporate the fabrication and demonstration of a ground-based prototype avionics integration laboratory and construction and flight testing of prototype air vehicle designs. This program element is managed under three separate projects: Project 2472 (ATF) which focuses primarily on the development of the flight vehicle and related subsystems and technologies, Project 2878 (Advanced Tactical Fighter Engine) which develops and tests advanced propulsion systems with the efficiency and reliability required for the ATF mission, and Project 2995 (Critical Subsystems Development) which matures key avionics/armament technologies required to achieve ATF capability objectives with respect to situational awareness, offensive lethality, and threat warning/countermeasures. During FSD, all activities will be managed under Program Element # 0604239F. FSD is scheduled to begin in the 4th quarter of FY 1991, but contract award is contingent upon Congressional resolution of FSD start date.

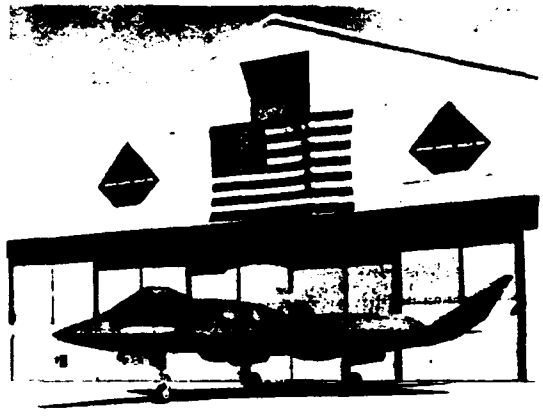
FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603230F
PE Title: Advanced Tactical Fighter (ATF)

Project: # 2472
Budget Activity: # 4 - Tactical Programs

Project Title: ATF





POPULAR NAME: ATF

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	Program Total (To Complete)
Major Contract	429,682	294,400	0	1,051,175 (0)
Support Contract	0	0	0	0 (0)
In-House Support	4,810	10,387	0	30,737 (0)
GFE/ Other	16,383	22,008	0	54,441 (0)
Total	450,875	331,795		1,136,353 (0)
SCHEDULE	FY 1990	FY 1991	FY 1992	To Complete
Program Milestones		DAB II		
Engineering Milestones				
T&E Milestones	Proto vehicle FF/flight test	Proto vehicle complete flight test reports		
Contract Milestones		FSD RFP/SS & Contract award*		

* Contract award contingent upon Congressional resolution of FSD start date.

Program Element: #0603230F
PE Title: Advanced Tactical Fighter (ATF)
Project: # 2472
Budget Activity: # 4 - Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Project 2472, Advanced Tactical Fighter (ATF), focuses primarily on the development of the flight vehicle and related subsystems and technologies. It continues development of the next generation air superiority fighter aircraft design with the performance and survivability features required to counter advanced Soviet fighters that will appear in large numbers in the early 1990s. In this advanced development project, flight vehicle technologies, design concepts, subsystem approaches, advanced materials, etc., that will be important to achieving ATF program and capability objectives will be demonstrated and validated. This will be accomplished through the use of trade-off analyses, detailed design work, wind tunnel and radar cross section tests, materials and component design tests, as well as hardware demonstrations including fabrication and flight testing of air vehicle prototypes.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Conducted Full Scale Model RCS Tests.
   - (U) Conducted System Design Reviews with prime contractors.
   - (U) Completed integration of prototype aircraft subsystems and system checkout for first flight.
   - (U) Conducted first flights on each aircraft/engine combination.

2. (U) FY 1991 Planned Program:
   - (U) Complete prototype aircraft flight tests, data collection, and analysis.
   - (U) Complete Full-Scale Development (FSD) source selection and award contract to a single airframe contractor team and single engine contractor (see PE #0604239F).

3. (U) FY 1992 Planned Program: Program completed.

4. (U) FY 1993 Planned Program: Program completed.

5. (U) Program to Completion: Not Applicable (Completes in FY 1991).

D. (U) WORK PERFORMED BY: Technology and advanced development efforts for ATF are being managed by the Aeronautical Systems Division, Wright-Patterson AFB OH. Lockheed Aeronautical Systems Co, Burbank CA and Northrop Corp, Hawthorne CA are the prime weapon system contractors for the Demonstration/Validation (Dem/Val) phase. As a result of teaming agreements, Boeing and General Dynamics will be principal subcontractors to Lockheed, and McDonnell Aircraft Co will be principal subcontractor to Northrop.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: None.

3. (U) COST CHANGES: $113,905 increase in cost of extending Dem/Val for 6 months.

Program Element: #0603230F
PE Title: Advanced Tactical Fighter (ATF)
Project: # 2472
Budget Activity: # 4 - Tactical Programs

F. (U) PROGRAM DOCUMENTATION:
- (U) TAF SON 304-83, 9 Nov 84.
- (U) TAF 304-83-I/IIA, SORD for ATF (Revision #1), 26 Apr 90.
- (U) ATF TEMP, 3 Mar 89.

G. (U) RELATED ACTIVITIES:
- (U) At the completion of the Dem/Val phase and a Milestone II decision in FY 1991, ATF will enter FSD and be funded under PE #0604239F (ATF Engineering).
- (U) ATF procurement will be funded under PE #0207219F (ATF).
- (U) Engineering development for ATF training systems is funded in PE#0604227F (Flight Simulator Development).
- (U) In addition to the programs related generally to the ATF(PE #0603230F), there are several generic and continuing technology-base efforts (listed below) that continue to advance the state of the art in air vehicle related technologies and provide the technology base that will contribute to the development of not only the ATF but other air weapon systems, military aircraft, and even commercial aircraft.
- (U) PE #0603205F, Aerospace Flight Vehicle Technology.
- (U) PE #0603211F, Aerospace Structures and Materials.
- (U) PE #0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE #0603245F, Advanced Flight Technology Integration.
- (U) Navy PE #0603231N (Navy Advanced Tactical Fighter) develops and demonstrates the Navy derivative of the ATF. (Navy terminated funding for NATF beginning in FY 1992.)
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

1. (U) PROCUREMENT: Not applicable.

2. (U) MILITARY CONSTRUCTION: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
Structural/material tests	Ongoing	
Wind tunnel tests	Ongoing	
RCS Model Tests	Ongoing	
Full scale mission simulations	4Q/FY 1988	SUCCESSFUL
Escape system qualification tests	4Q/FY 1989	SUCCESSFUL

Program Element: #0603230F
PE Title: Advanced Tactical Fighter (ATF)

Project: # 2472
Budget Activity: # 4 - Tactical Programs

T&E ACTIVITY (PAST 36 MONTHS) - continued

Event	Planned Date	Remarks
Full scale model signature tests	2Q/FY 1990	SUCCESSFUL
Prototype aircraft first flight	4Q/FY 1990	SUCCESSFUL
Complete prototype aircraft flight test	1Q/FY 1991	SUCCESSFUL

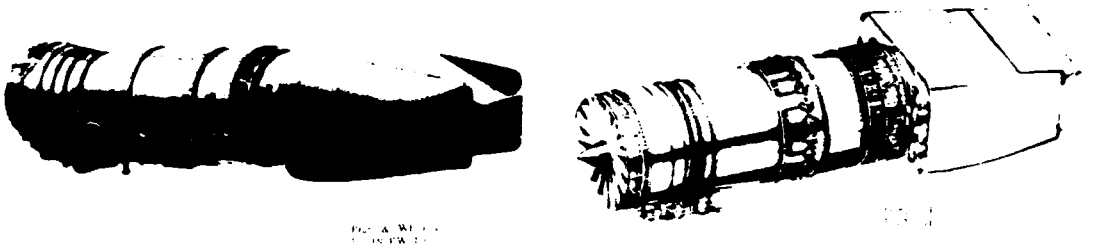
T&E ACTIVITY (TO COMPLETION)- N/A

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0603230F
PE Title: Advanced Tactical Fighter (ATF)

Project: # 2878
Budget Activity: #4 - Tactical Programs

Project Title: ATF Engine



POPULAR NAME: ATF Engine

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	Program Total (To Complete)
Major Contract	271,345	395,567	0	1,795,449 (0)
Support Contract	0	0	0	0 (0)
In-House Support	0	0	0	0 (0)
GFE/ Other	22,332	0	0	77,323 (0)
Total	293,677	395,567	0	1,872,772 (0)
SCHEDULE	FY 1990	FY 1991	FY 1992	To Complete
Program Milestones		DAB II		
Engineering Milestones	Sys Spec SDR/Proto eng IFR/ DEV ENG DDR	DDR for FSD		
T&E Milestones	Proto FF	Complete test First dev engine		
Contract Milestones		FSD RFP/SS & contract award*		

* Contract award contingent upon Congressional resolution of FSD start date.

Program Element: # 0603230F
PE Title: Advanced Tactical Fighter (ATF)
Project: # 2878
Budget Activity: # 4 - Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Project 2878 (Advanced Tactical Fighter Engine) will develop and test advanced propulsion systems for the Advanced Tactical Fighter (ATF) mission. The project seeks advances in propulsion technology that will be essential to achieving the significant capability improvements needed in the next generation air superiority fighter, including efficient supersonic cruise, increased reliability, and reduced logistics support. This project funds prototype engine demonstration of two advanced engine designs to support the flight demonstration of prototype ATF aircraft prior to Full-Scale Development (FSD) and does the necessary development/fabrication work to protect the weapon system FSD schedule.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Obtained IFR for prototype engines to support flight tests.
   - (U) Prepared requests for proposal (RFP) for the development and test of FSD engines/nozzles.

2. (U) FY 1991 Planned Program:
   - (U) Complete source selection for a single FSD engine contractor in third quarter FY 1991.
   - (U) Award FSD engine contract in 4th Qtr of FY 1991 (see PE#0604239F).

3. (U) FY 1992 Planned Program: Program completed.

4. (U) FY 1993 Planned Program: Program completed.

5. (U) Program to Completion: Not Applicable (Program completed in FY 1991).

D. (U) WORK PERFORMED BY: The advanced engine development is being managed by the Aeronautical Systems Division, Wright-Patterson AFB OH. Engine development contractors are United Technologies/Pratt & Whitney Government Engines, West Palm Beach FL and General Electric Co, General Electric Aircraft Engines, Evendale OH. At Milestone II, for the ATF program in FY 1991, a single contractor will be selected for full-scale development of the ATF engines.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: None.

3. (U) COST CHANGES: $57,156 decrease due to transfer of $330M which had originally been budgeted in the FSD PE and other government costs for engines associated with the 6-month extension.

F. (U) PROGRAM DOCUMENTATION:
   - (U) TAF SON 304-83, Nov 84.
   - (U) TAF 304-83-I/IIA, SORD for ATF (Revision 1), 1 Feb 89.
   - (U) ATF TEMP, 3 Mar 89.

Program Element: # 0603230F
PE Title: Advanced Tactical Fighter (ATF)
Project: # 2878
Budget Activity: # 4 - Tactical Programs

G. (U) RELATED ACTIVITIES:

- (U) At the completion of the Dem/Val phase and a Milestone II decision in FY 1991, ATF will enter FSD and be funded under PE #0604239F (ATF Engineering).
- (U) ATF procurement will be funded under PE #0207219F (ATF).
- (U) PE #0603202F, Aircraft Propulsion Subsystem Integration.
- (U) PE #0603216F, Aerospace Propulsion and Power Technology.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

1. (U) PROCUREMENT: Not applicable.

2. (U) MILITARY CONSTRUCTION: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
First demonstration engines to test		
- Pratt & Whitney	Oct 86	(Competition
- General Electric	May 87	Sensitive)
Two-dimensional nozzle thrust vectoring demonstrated		
- Pratt & Whitney	Feb 88	SUCCESSFUL
- General Electric	May 88	SUCCESSFUL
Preliminary design review of development engine	2Q/FY 1989	SUCCESSFUL
First prototype engine to test	2Q/FY 1989	SUCCESSFUL

Event	Planned Date	Remarks
First prototype engine delivery	2Q/FY 1990	SUCCESSFUL
Initial flight release of prototype engine	3Q/FY 1990	SUCCESSFUL
Prototype aircraft/engine first flight	4Q/FY 1990	SUCCESSFUL
Complete prototype engine flight test	1Q/FY 1991	SUCCESSFUL

T&E ACTIVITY (TO COMPLETION)

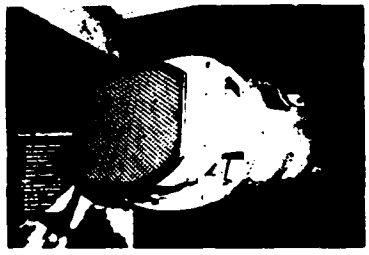
FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0603230F
PE Title: Advanced Tactical Fighter (ATF)

Project : # 2995
Budget Activity: # 4 - Tactical Programs

Project Title: Critical Subsystems Development





POPULAR NAME: Critical Subsystems

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	Program Total (To Complete)
Major Contract	285,015	29,705	0	529,320 (0)
Support Contract	0	0	0	0 (0)
In-House Support	0	0	0	0 (0)
GFE/ Other	1,569	0	0	6,769 (0)
Total	286,584	29,705	0	536,089 (0)
SCHEDULE	AFL FY 1990	FY 1991	FY 1992	To Complete
Program Milestones	AGP & AFL	DAB II		
Engineering Milestones	AFL System Spec SDR AGP demo			
T&E Milestones	Fault-tol tests/Sensor flight demos	Complete AGP & AFL demos		
Contract Milestones		FSD contract award*		

* Contract award contingent upon Congressional resolution of FSD start date.

Program Element: # 0603230F
PE Title: Advanced Tactical Fighter (ATF)
Project : # 2995
Budget Activity: # 4 - Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Project 2995 (Critical Subsystems Development) will mature key avionics/armament technologies required to achieve Advanced Tactical Fighter (ATF) capability objectives with respect to situational awareness, offensive lethality, and threat warning/countermeasures. Critical Subsystems Development will demonstrate that certain subsystems employing advanced technologies critical to the development of the ATF can be successfully integrated into an effective system. Several critical technologies in weapons integration, avionics integration, and advanced radar/sensor development must be matured prior to aircraft design freeze. The state-of-the-art microelectronics, sensors, and advanced integrated avionics subsystems developed for ATF in this project will make it possible to process extraordinary amounts of sensor data and vastly improve the pilot's capabilities for threat definition, situational awareness, aircraft fire and flight control, weapon/countermeasure systems management, etc. This project began in FY 85 and will be completed in time to support a Full-Scale Development (FSD) decision in FY 1991. ATF avionics will exhibit a high degree of commonality with the Joint Integrated Avionics Working Group (JIAWG) developed specifications.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Performed tests to verify fault isolation/fault tolerance and other aspects of the integrated avionics architecture including sensor fusion, pilot vehicle interface, beyond-visual-range target classification, etc.
   - (U) Demonstrated critical flight-related elements of the avionics architecture in avionics flying laboratories (AFL).
   - (U) Continued avionics trade studies and other avionics risk reduction/design refinement activities.
   - (U) Incorporated avionics requirements in FSD request for proposals and in source selection evaluation for a single prime contractor.

2. (U) FY 1991 Planned Program:
   - (U) Complete Dem/Val avionics data collection and analysis in FY 1991.
   - (U) Complete FSD source selection and award contract (see PE #0604239).

3. (U) FY 1992 Planned Program: Program completed.

2. (U) FY 1991 Planned Program: Program completed.

3. (U) Program to Completion: Not applicable (Completes in FY 1991).

D. (U) WORK PERFORMED BY: Avionics technology and advanced development efforts for ATF are being managed by Aeronautical Systems Division, Wright-Patterson AFB OH. Total ATF weapon system responsibilities, including avionics integration, rest with the prime contractors, Lockheed Aeronautical Systems Company, Burbank CA and Northrop Corporation, Hawthorne CA. Major subcontractors to the ATF primes for avionics subsystems include TRW, San Diego CA, Westinghouse, Baltimore MD, Texas Instruments, Dallas TX, Martin Marietta, Orlando FL, General Electric, Utica NY, AT&T, Whippany NJ, UNISYS, Minneapolis MN, Sanders Corp, Nashua NH, Hughes Corp, Los Angeles CA, and Harris Corp, Melbourne FL.

Program Element: # 0603230F
PE Title: Advanced Tactical Fighter (ATF)
Project : # 2995
Budget Activity: # 4 - Tactical Programs

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: None.

3. (U) COST CHANGES: $82,511 decrease due to reductions in armament effort during 1991, and reduced funding in 1990.

F. (U) PROGRAM DOCUMENTATION:
- (U) TAF SON 304-83, 9 Nov 84.
- (U) TAF 304-83-I/IIA, SORD for ATF (Revision 1), 1 Feb 89.
- (U) ATF TEMP, 3 Mar 89.

G. (U) RELATED ACTIVITIES:
- (U) Complete Full-Scale Development (FSD) source selection and award contract to a single airframe contractor team and single engine contractor (see PE #0604239F).
- (U) ATF procurement will be funded under PE #0207219F (ATF).
- (U) In addition to the programs related generally to the ATF PE #0603230F, there are several generic and continuing technology-base efforts (listed below) that are advancing the state-of-the-art in microelectronics integrated circuits, and avionics systems that will contribute to the development of ATF and other future avionics systems.
- (U) PE #0603109F, Integrated Electronic Warfare System/Integrated Communications Navigation Identification Avionics (INEWS/ICNIA).
- (U) PE #0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE #0603253F, Advanced Avionics Integration.
- (U) PE #0603452F, Very High Speed Integrated Circuits (VHSIC).
- (U) PE #0603742F, Combat Identification Technologies.
- (U) PE #0603270F, Electronic Combat Technology
- (U) PE #0604236F, Infrared Search and Track System (IRSTS).
- (U) PE #0604250F, Integrated Electronic Warfare/Integrated Communications, Navigation, Identification Development.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

1. (U) PROCUREMENT: Not applicable.

2. (U) MILITARY CONSTRUCTION: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
Avionics Ground Prototype (AGP) specifications released	Aug 1987	
Initial avionics prototype core demonstrations	1Q/FY 1989	Successful
Begin flying AFL demonstrations	Ongoing	Successful

Program Element: # 0603230F
PE Title: Advanced Tactical Fighter (ATF)

Project : # 2995
Budget Activity: # 4 - Tactical Programs

Event	Planned Date	Remarks
Final avionics prototype demonstrations	3Q/FY 1991	Successful
test bed demonstrations	3Q/FY 1991	Successful

T&E ACTIVITY (TO COMPLETION) N/A

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603231F Budget Activity: #2 - Advanced Technology Development
PE Title: Crew Systems and Personnel Protection Technology

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2722 Biomedical Chemical Warfare Defense	4,829	4,000	4,152	4,297	Cont	TBD
2829 Crew-Centered Cockpit Design	4,473	4,100	4,256	4,405	Cont	TBD
2830 Advanced Life Support Systems	2,586	2,000	2,076	2,249	Cont	TBD
2868 Crew Escape Technologies	1,127	2,402	2,493	2,825	Cont	TBD
2992 Space Crew Enhancement	453	700	773	556	Cont	TBD
3257 Helmet-Mounted Systems Technology	4,891	4,617	4,792	4,937	Cont	TBD
Total	18,359	17,819	18,542	19,269	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology Advanced Technology Development project integrates and demonstrates technologies to protect and extend the performance of Air Force personnel in operational environments. Goals include improving combat effectiveness and the protective features of air and groundcrew life support equipment by including human factors in the design process of cockpits and life support equipment. Concepts in this program element feed into full scale development programs to address documented needs from USAF commands for specific warfighting capabilities.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2722, Biomedical Chemical Warfare Defense: This project ensures protection and performance of aerospace mission and support personnel, maintenance of combat sortie generation rates, and adequate treatment of casualties in a chemical warfare environment. In coordination with the Army, this research meets documented Air Force needs to perform combat operations in chemical/biological environments, and modeling of wartime attrition.

(U) FY 1990 Accomplishments:
- (U) Demonstrated the threat-related attrition (THREAT) model - determined combat attrition based on location of medical collective protective shelter.
- (U) Expedited transitioning of multi-man intermittent cooling (MMICS) to Desert Shield - groundcrews cool during flightline breaks, in chemical defense ensembles, which improves their ability to sustain sortie generation rates.

Program Element: #0603231F Budget Activity: #2 - Advanced Technology Development
PE Title: Crew Systems and Personnel Protection Technology

(U) FY 1991 Planned Program:
- (U) Develop THREAT models using general purpose munitions and chemical weapons effects for protected/unprotected structures.
- (U) Develop and test 1st and 2nd Echelon Wartime Medical (WARMED) computer model to determine front line medical requirements.

(U) FY 1992 Planned Program:
- (U) Develop THREAT models to include effects of air-to-surface explosives; and for disease/non-battle injuries/combat stress.
- (U) Develop and test 3rd and 4th Echelon WAR-MED model to determine medical support and resupply requirements.

(U) FY 1993 Planned Program:
- (U) Develop and test THREAT models incorporating effects of advanced weapons, upgraded chemical effects and ground attacks.
- (U) Develop and test theater-wide WAR-MED model to determine the requirements and efficacy of the medical system.

(U) Work Performed By: BDM International, McLean VA. Cooperative efforts with the Armstrong Laboratory, Uniformed Services University for Health Sciences, and Phillips Laboratory.

(U) Related Activities:
(U) Program Element #0602202F, Human Systems Technology.
(U) PE #0604703F, Aeromedical/Chemical Defense Systems Dev.
(U) PE #0604601F, Chemical Defense Equipment.
(U) The Army is DOD lead for chemical warfare defense.
(U) Multiservice applications identified in the Joint Service R&D and Acquisition Plan for Chemical Warfare Defense.
(U) Medical chemical defense coordinated by Armed Services Biomedical Research, Engineering and Management Committee.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2829, Crew-Centered Cockpit Design: This project develops a computerized crew system design and development process to help engineers design/modify cockpits for efficient use of aircrew abilities. Software tools developed integrate systems and human factors engineering principles early in the acquisition cycle for manned aerospace vehicles. It predicts pilot performance and mission success as functions of cockpit instrumentation and automation as referenced to well-understood baseline weapon systems to quantify human/system trade-offs. Rapid prototyping tools will improve ability to quickly design/evaluate cockpit configurations.

(U) FY 1990 Accomplishments:
- (U) Integrated a breadboard cockpit simulator as the rapid

prototyping test article for real-time cockpit evaluation.
- (U) Developed tools to assess cockpit modifications to reduce the number of crew members required for airlift aircraft.

(U) FY 1991 Planned Program:
- (U) Establish a validation program for a crew-centered design process and perform field demonstrations.
- (U) Transition validated CAE/CAD tools to information center.
- (U) Complete test and demonstration of the rapid cockpit prototyping system.

(U) FY 1992 Planned Program:
- (U) Continue validating processes and building databases and design guides for effective cockpit designs/modifications.
- (U) Initiate development of performance/workload evaluation.
- (U) Demonstrate rapid prototyping process and design tools to evaluate modifications to transport aircraft.

(U) FY 1993 Planned Program:
- (U) Continue validation and transition of crew-centered computer design software and database for cockpit design.
- (U) Provide human performance databases to Defense Logistics Agency Crew System Ergonomics Information Analysis Center.

(U) Work Performed By: Veda Inc., Dayton OH; and Boeing Military Airplanes, Seattle WA. Software tests performed by the Naval Air Development Center, Defense Logistics Agency, and Aeronautical Systems Division.

(U) Related Activities:
- (U) PE #0602202F, Human Systems Technology.
- (U) PE #0603205F, Aerospace Vehicle Technology - Agreement matrixes manning for developing pilot/vehicle interface.
- (U) Coordination occurs through a Crew Station Working Group within Air Force Systems Command; a Joint Aeronautical Commander's Group Committee; and DOD Human Factors Engineering Technical Advisory Group.
- (U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not applicable.

3. (U) Project 2830, Advanced Life Support Systems (ALSS): This project develops and integrates advanced aircrew life support subsystems. The goal is to improve aircrew combat performance and protection from physiological threats including: high altitudes, high G-forces, electromagnetic threats, thermal burden and ballistic injury. This work supports requirements from SAC for high altitude protection and TAC for improved G-protection.

Program Element: #0603231F Budget Activity: #2 - Advanced Technology Development
PE Title: Crew Systems and Personnel Protection Technology

(U) FY 1990 Accomplishments:
- (U) Integrated chem defense respirator with a positive pressure breathing system (COMBAT EDGE) to double G tolerance (amount of G's a pilot can "pull") with chem protection.

(U) FY 1991 Planned Program:
- (U) Evaluate pilot performance wearing the combined chemical defense/positive pressure breathing system.
- (U) Transition chemical defense capability for positive pressure breathing system (COMBAT EDGE) into full scale development.

(U) FY 1992 Planned Program:
- (U) Test full coverage G-suit to double endurance (amount of time a pilot can "pull" G's.
- (U) Initiate development of integrated life support ensembles to include ballistic and eye (LASER/THERMAL) protection.

(U) FY 1993 Planned Program:
- (U) Determine design requirements for ballistic protection for close air support aircraft (cockpits, seats, and body armor).
- (U) Determine design requirements for eye protection from laser, balistic, and nuclear flash hazards.

(U) Work Performed By: Boeing Advanced Systems, Seattle WA and ILC Dover, Dover DE. In-house development and testing by Armstrong Laboratory, Brooks AFB TX.

(U) Related Activities:
(U) PE #0602202F, Human Systems Technology.
(U) PE #0604706F, Life Support Systems.
(U) Life support activities are included in the USAF Ten Year Life Support Master Development Plan.
(U) Coordinated through Tri-Service Life Support Group.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Prototype hardware from the tactical life support system was provided to Canada for their own development program to improve aircrew anti-G protection in CF-18 aircraft. This project is coordinated with the Air Standardization Coordinating Committee, NATO Advisory Groups on Aerospace Research and Development, and specific Data Exchange Agreements.

4. (U) Project 2868, Crew Escape Technologies (CREST): This project integrates advanced technologies into an ejection seat capable of protecting aircrew throughout the performance envelope of modern aircraft. The goal is to reduce fatalities and major injury rates in emergency ejections at speeds between 0 and 700 knots, and approximately double the current safe ejection envelope. CREST

Program Element: #0603231F Budget Activity: #2 - Advanced Technology Development
PE Title: Crew Systems and Personnel Protection Technology

will also improve the reliability, maintainability and capability for logistics support over current ejection seats. This work supports a TAC requirement for improved aircrew restraint.

(U) FY 1990 Accomplishments:
- (U) Prepared rocket test sled incorporating a moveable F-16 forebody and instrumented manikin to measure ejection forces.
- (U) Performed tests at various speeds attitude configurations culminating with a 700 knot test to evaluate system capability.

(U) FY 1991 Planned Program:
- (U) Begin concept investigation of technologies for hypersonic escape vehicles; and concept evaluation of lightweight seats incorporating aircrew shielding for close air support.
- (U) Continue evaluation of rocket test sled system to define full capabilities of system to produce and measure the ejection forces within the F-16 performance envelope.

(U) FY 1992 Planned Program:
- (U) Complete test of rocket sled, manikin, and aerodynamically reefed parachutes.
- (U) Develop requirements of a "smart" computer controlled ejection seat to steer the pilot away from an impact with the ground during a high sink rate or adverse attitude ejection.

(U) FY 1993 Planned Program:
- (U) Complete demonstration of restraints and retraction systems.
- (U) Continue "smart" seat requirements analysis to yield system specification for thrust vectored, stearable, low weight, seat.

(U) Work Performed By: In-house development and testing by the Armstrong Laboratory, Wright-Patterson AFB OH. The 6585th Test Group, Holloman AFB NM provides test support.

(U) Related Activities:
(U) PE #0602202F, Human Systems Technology.
(U) PE #0604706F, Life Support Systems.
(U) PE #0603269F, National Aerospace Plane.
(U) Life support activities are included in the USAF Ten Year Life Support Master Development Plan.
(U) Coordinated through Tri-Service Life Support Group.
(U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 2992, Space Crew Enhancement (SPACE): This project develops specialized crew protection and man-machine integration needed to support possible military space missions. The goal is to

Program Element: #0603231F Budget Activity: #2 - Advanced Technology Development
PE Title: Crew Systems and Personnel Protection Technology

develop the database required to identify possible mission scenarios, crew capabilities, and crew requirements. This work supports AFSPACECOM requirements to determine man's ability to locate, observe, track, and extract militarily significant data of ground, sea, and air targets viewed from low earth orbit.

(U) FY 1990 Accomplishments:
- (U) Integrated telescope/manual tracking system on shuttle to measure astronaut's ability to locate/observe military targets.

(U) FY 1991 Planned Program:
- (U) Evaluate man-machine interface of telescope/manual tracking system on shuttle in support of classified Army experiment.
- (U) Develop pressure suit glove technology to improve tactility and dexterity for transatmospheric missions (i.e., NASP).

(U) FY 1992 Planned Program:
- (U) Initiate studies to quantify human performance requirements for improved C3 system operation from space.
- (U) Develop man-machine requirements of a computer stabilized telescope interfaced to the shuttle nav system to demonstrate the military utility of an astronaut observer.

(U) FY 1993 Planned Program:
- (U) Continue development of transatmospheric crew protection.
- (U) Transition telescope and human interface design specifications to AFSPACECOM for manned operational experiments from orbit.

(U) Work Performed By: In-house development by Armstrong Laboratory, Wright-Patterson AFB OH. Contractors: Rockwell International, Los Angeles Ca, and Systems Research Laboratories, Beavercreek OH.

(U) Related Activities:
- (U) PE #0602202F, Human Systems Technology.
- (U) PE #0604706F, Life Support Systems.
- (U) PE #0603269F, National Aerospace Plane
- (U) Military space crew activities coordinated through Military/ NASA Space Technology Interdependency Group.
- (U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 3257, Helmet-Mounted Systems Technology: This project develops helmet-mounted systems technology for aircraft cockpits to improve pilot situational awareness. Helmet-mounted displays are sight and sound projections to help the pilot interact with the world in a natural, intuitive manner regardless of visibility beyond the cockpit. One specific goal is to integrate into a fire

Program Element: #0603231F Budget Activity: #2 - Advanced Technology Development
PE Title: Crew Systems and Personnel Protection Technology

control system technology which will allow the pilot, by turning his head, to utilize the full capability of his air-to-air and air-to-surface weapons. This work supports requirements for an A-16 head-steered FLIR and improved night vision goggles.

(U) FY 1990 Accomplishments:
- (U) Completed concept evaluation of integrated night vision goggle and helmet-mounted display/sight (HMD/S).
- (U) Completed initial ground tests of the integrated HMD/S for non-ejection seat aircraft.

(U) FY 1991 Planned Program:
- (U) Complete flight demonstrations of integrated HMD/S system for non-ejection seat aircraft.
- (U) Perform ground tests of integrated HMD/S system for B-52 and F-16 aircraft.
- (U) Begin development of air-to-surface, binocular helmet-mounted display and auditory display.

(U) FY 1992 Planned Program:
- (U) Continue development of integrated HMD/S for day and night operations.
- (U) Provide critical design on two competitive HMD/S concepts.

(U) FY 1993 Planned Program:
- (U) Bench test the HMD/S concepts, down select to one concept.
- (U) Complete test documentation and Class II modification review.

(U) Work Performed By: In-house development by Armstrong Laboratory, Wright-Patterson AFB OH. Development of advanced, integrated NVG and HMD awarded to McDonnell Aircraft Company, St. Louis MO, as a joint effort with Naval Air Systems Command. Advanced Technology Transition Demonstration accomplished with AFTI/F-16 Air Force Flight Test Center, Edwards AFB, CA, SAC, MAC, ANG, and AFRES.

(U) Related Activities:
- (U) PE #0602202F, Human Systems Technology.
- (U) PE #0603790D, NATO Cooperative R&D.
- (U) PE #0604706F, Life Support Systems.
- (U) Coordination occurs with Crew Station Working Group within Air Force Systems Command.
- (U) Joint development with the Navy on helmet-mounted displays and integrated night vision goggles.
- (U) No unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603245F Budget Activity: #2 - Advanced Technology Development
PE Title: Advanced Flight Technology Integration (AFTI)

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2061 Vehicle/Avionics/Weapon Integration	10,020	17,551	13,867	8,866	Cont	TBD
2568 Advanced Wing/Configuration Technology	675	1,970	5,490	4,211	Cont	TBD
2682 Airframe Propulsion Integration	7,796	3,222	1,300	3,237	Cont	TBD
2979 Reliability and Maintainability	1,281	418	3,416	9,221	Cont	TBD
3391 X-29 Advanced Tech Demonstrator	1,634	0	0	0	0	28,434
Total	21,406	23,161	24,073	25,535	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program flight tests integrated technologies to provide increased aircraft performance and survivability. Emphasis is on technologies which can provide low maintenance, and increased reliability at low cost. Flight testing is critical to verifying real world benefits/penalties of integrated systems and reducing the risk of transitioning technology. Program Element (PE) 0603205F, Aerospace Vehicle Technology, complements this PE by providing component technologies to be integrated and flight tested. Increased project 2061 FY91 funding reflects Integrated Control and Avionics for Air Superiority (ICAAS) aircraft modification and AFTI F-16 forward looking infrared (FLIR) flight testing starting. Starting in FY92, decreasing project 2061 funding reflects decreased ICAAS and AFTI F-16 FLIR flight testing. The FY92 project 2568 increase reflects the joint Navy/DARPA/AF/NASA high angle-of-attack advanced maneuvering flight validation program being conducted. Decreased project 2682 FY91/92 funding reflects STOL/MTD flight testing completion in FY91 and vehicle fligh/propulsion control integration and test planning taking place. FY92 project 2979 increase reflects increased emphasis on aircraft reliability & maintainability (R&M). Project 3391 ends in FY90 with X-29 program objectives completion.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2568, Advanced Wing/Configuration Technology: Improves aircraft maneuverability during combat, and increases range and fuel efficiency at cruise speeds. Includes the NASA/AF Hybrid Laminar Flow Control (HLFC) program which is evaluating cruise

range and fuel savings improvements using leading edge suction to maintain smooth air flow over the wing. A second program also leverages USAF funds with NASA to demonstrate and test the military utility of advanced aircraft maneuvering technologies.

(U) FY 1990 Accomplishments:
- (U) Demonstrated 15% fuel savings for transport aircraft thru operational HLFC flight tests.

(U) FY 1991 Planned Program:
- (U) Complete HLFC flight test data analysis and publish report.
- (U) Modify USAF/NASA flight testbed with advanced maneuvering and control technologies for emergency and tailless aircraft operation.

(U) FY 1992 Planned Program:
- (U) Develop joint agency test plan for application of multi-axis thrust vectoring and high angle-of-attack technologies to a multi-role fighter.
- (U) Evaluate multi-axis thrust vectoring maneuvering capabilities for advanced air-to-air combat tactics.

(U) FY 1993 Planned Program:
- (U) Complete flight testing to determine performance benefits and military utility of advanced maneuvering technologies.
- (U) Complete flight analysis and comparison with predicted air-to-air combat maneuver execution improvements.

(U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright Patterson AFB, OH. The prime contractor is Boeing, Seattle WA.

(U) Related Activities:
(U) PE #0603205F, Aerospace Vehicle Technology
(U) PE #0603211F, Aerospace Structures
(U) PE #0603203F, Advanced Avionics for Aerospace Vehicles
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2682, Airframe Propulsion Integration: Integrates flight control with the propulsion system (inlet, engine and nozzles) and the vehicle subsystem within a fault tolerant architecture to achieve improved aircraft performance. A vehicle propulsion integration (VPI) system will flight demonstrate optimized supersonic fighter performance. This integrated system will utilize a full authority digital engine control (FADEC), Multi-

Program Element: #0603245F Budget Activity: #2 - Advanced Technology
Title: Advanced Flight Technology Integration (AFTI) Development

Axis (pitch and yaw) Thrust Vectoring (MATV) nozzles, fault tolerant system architectures, and reconfiguration strategies to improve aircraft performance, range, and engine life. The F-15 Short Takeoff and Landing/Maneuver Technology Demo (STOL/MTD) program integrates and flight tests pitch axis thrust vectoring/reversing (TV/TR) exhaust nozzles, integrated flight and nozzle controls, autonomous landing guidance, and rough field landing gear. The result is an aircraft that (a) has improved maneuver and deceleration performance, and (b) has the capability (day or night) to land on short runways without the aid of ground-based equipment.

(U) FY 1990 Accomplishments:
- (U) STOL/MTD demonstrated 29% takeoff and 72% landing distance reduction (compared to standard F-15) using TR/TV nozzles.
- (U) STOL/MTD demonstrated increased pitch rate and supersonic deceleration performance using TV/TR nozzles.
- (U) STOL/MTD demonstrated autonomous night landing capability.

(U) FY 1991 Planned Program:
- (U) Complete STOL/MTD military operational utility testing.
- (U) Complete in-flight measurements of STOL/MTD TV/TR nozzle infrared signature properties.
- (U) Start pre-design of a vehicle/propulsion integration flight test demonstration.

(U) FY 1992 Planned Program:
- (U) Integrate software and hardware for the vehicle flight/propulsion integrated control system.
- (U) Complete axisymmetric MATV nozzle ground test validation.

(U) FY 1993 Planned Program:
- (U) Accomplish FADEC integration with the control system.
- (U) Modify testbed aircraft for MATV incorporation.
- (U) Complete detailed design of aircraft modifications including integration of axisymmetic MATV nozzles.

(U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright Patterson AFB, OH. The prime contractor is McDonnell Douglas Aircraft Co, St Louis MO. Flight testing is performed at Edwards AFB, CA.

(U) Related Activities:
(U) PE #0603205F, Aerospace Vehicle Technology.
(U) PE #0603230F, Advanced Tactical Fighter.
(U) PE #0603216F, Aerospace Propulsion and Power.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in thousands): Not Applicable.

Program Element: #0603245F Budget Activity: #2 - Advanced Technology
Title: Advanced Flight Technology Integration (AFTI) Development

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2979, Reliability and Maintainability: Improves the reliability, maintainability, and supportability (RM&S) of aircraft while increasing performance, survivability and mission effectiveness. Under this project, the Self Repairing Flight Control System (SRFCS) program flight demonstrates software for flight control system reconfiguration and in-flight diagnostics developed under PE 0603205F. Integration of control reconfiguration and thrust vectoring has the potential to also reduce vertical tail size or allow tailless supersonic aircraft designs which leads to lower aircraft weight, drag and observability. The resultant fault tolerant reconfigurable flight control system (FCS) design will be incorporated into the vehicle/propulsion control integration flight test program in project 2682.

(U) FY 1990 Accomplishments:
- (U) Completed SRFCS single control surface failure reconfiguration flight test and in-flight diagnostics.

(U) FY 1991 Planned Program:
- (U) Complete flight test analysis and report for single surface reconfiguration demonstration.

(U) FY 1992 Planned Program:
- (U) Design integrated adaptive control architecture for vehicle-propulsion integration (VPI).
- (U) Incorporate propulsion system and thrust vectoring capability into the reconfiguration flight control laws.

(U) FY 1993 Planned Program:
- (U) Complete preliminary design of adaptive control logic for VPI to handle high angle-of-attack aerodynamic uncertainties.
- (U) Integrate reconfiguration capability into VPI testbed.
- (U) Incrementally flight test VPI control reconfiguration of a propulsion control and thrust vectoring capability.

(U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright Patterson AFB, OH. The prime contractor is McDonnell Douglas Co., St. Louis MO.

(U) Related Activities:
(U) PE #0603205F, Aerospace Vehicle Technology.
(U) PE #0603211F, Aerospace Structures.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603245F
PE Title: Advanced Flight Technology Integration (AFTI)
Project Number: 2061
Budget Activity: #2 - Advanced Technology Development

A. (U) RESOURCES ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Vehicle/Avionics/Weapons Integration	10,020	17,551	13,867	8,866	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
This project integrates and flight tests sensors, fire control, flight control, weapons and pilot/vehicle interfaces to successfully acquire, engage, and destroy multiple air and ground targets and survive. The Integrated Control and Avionics for Air Superiority (ICAAS) program addresses the few (friendly) vs many (enemy) fighter air-to-air engagement at beyond visual range (BVR). Benefits of cooperative action (internetting) among friendly fighters, sensor data fusion, automated options for engagement (integrated vehicle flight/fire control), and advanced pilot/vehicle interfaces will be determined by flight test. To reduce development risk and provide interim products flight testing will be initiated with one testbed aircraft before adding a second testbed aircraft (ICAAS wingman) to demonstrate 2vs4 engagements. The ICAAS design goal is to achieve true four ship integrated engagements (currently the norm is two-ship engagement). Payoffs are (a) a projected 10:1 air-to-air combat exchange ratio, (b) a greatly improved situational awareness during engagement operations, (c) more effective use of air-to-air missiles, and (d) greater survivability. The AFTI F-16 program integrates and flight demonstrates technologies to enhance ground attack capability. Projected payoffs are a 50% improvement in first pass target acquisition capability, increased standoff range, and a 3 to 1 improvement in aircraft survivability. The special operations forces, transport, and tactical aircraft cockpit programs are outlets for cockpit technologies by applying crew-vehicle integration techniques through simulation and flight test, demonstrating reductions in crew workload and improvements in weapon system performance. The special operations forces and transport aircraft cockpit effort will demonstrate a common pilot/vehicle interface for both theater resupply and special operations. Covert penetration, threat detection/avoidance, and autonomous operations are fundamental design drivers. The tactical aircraft cockpit program will improve performance and provide additional crew capability in high intensity mission segments and all weather, night operations. The hypersonic air vehicle program identifies critical technology paths and demonstrations integrating airframe, avionics, weapons, and propulsion technologies.

Program Element: #06[illegible]45F
Title: Advanced Flight Technology Integration (AFTI)
Project Number: 2061
Budget Activity: #2 - Advanced Technology Development

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Initiated ICAAS aircraft modification activity (new cockpit instrument panel, data link, and flight computer integration).
   - (U) AFTI F-16 successfully demonstrated laser spot tracker and two ship coordinated attack against multiple ground targets.
   - (U) Completed AFTI F-16 upgrade and began under the weather night attack technologies integration.

2. (U) FY 1991 Planned Program:
   - (U) Complete ICAAS software integration and primary aircraft modification and checkout.
   - (U) Flight test AFTI F-16 integrated hardware/software for single seat fighter automation (includes under the weather night attack, terrain following, and threat avoidance technologies).
   - (U) Integrate and flight test advanced forward looking infrared (FLIR) technology on AFTI F-16 aircraft.

3. (U) FY 1992 Planned Program:
   - (U) Complete ICAAS 1vs4 engagement technologies flight testing.
   - (U) Complete ICAAS wingman aircraft mod and initiate 2vs4 engagements to validate transition of technology.
   - (U) Define special operations forces, transport, and tac[illegible]ical aircraft cockpit technology integration and flight test requirements.
   - (U) Complete AFTI F-16 FLIR flight testing.
   - (U) Integrate standoff weapon technology on AFTI F-16.
   - (U) Assess hypersonic vehicle technology.

4. (U) FY 1993 Planned Program:
   - (U) Complete 2vs4 flight testing of ICAAS engagement technologies.
   - (U) Complete ICAAS program and transfer technology for fleet aircraft preplanned product improvement and system upgrades.
   - (U) Conduct AFTI F-16 standoff weapon flight testing.
   - (U) Complete special operations, transport, and tactical aircraft cockpit integration and checkout.
   - (U) Identify critical technology paths and integrated hypersonic technology demonstrations.

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

D. (U) WORK PERFORMED BY: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright Patterson AFB, OH, and the Armament Directorate, Eglin AFB, FL. The two prime contractors are McDonnell Douglas, St Louis MO; and General Dynamics, Ft. Worth TX. Flight testing is conducted at the Air Force Flight Test Center, Edwards AFB, CA with support from NASA.

Program Element: #0603245F
Title: Advanced Flight Technology Integration (AFTI)
Project Number: 2061
Budget Activity: #2 - Advanced Technology Development

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: ICAAS primary aircraft modification and all flight test milestones have been delayed six months due to FY90/91 budget cuts.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:
(U) TAF SON 310-85, Air Defense Aircraft, 7 Jan 86.
(U) MAC SON 012-89, Advanced Theater Transport, draft.
(U) SAC SON 007-79, Military Space Flight Capability (S), 22 Sept 80.
(U) AFSPACECOM and SAC SORD, 206-84-I, Military Aerospace Vehicle (MAV) (S), draft.

G. (U) RELATED ACTIVITIES:
(U) Program Element #0603205F, Aerospace Vehicle Technology
(U) Program Element #0603230F, Advanced Tactical Fighter
(U) Program Element #0603245F, Adv Flight Technology Integration
(U) Program Element #0604212F, Aircraft Equipment Development
(U) Program Element #0603231F, Crew Systems Technology
(U) Program Element #0603253F, Advanced Avionics Integration
(U) Program Element #0603707E, Prototyping (Pilot's Associate Program)
(U) Program Element #0603737D, Balanced Technology Initiative (BTI)
(U) Program Element #0603269F, National Aerospace Plane (NASP)
(U) Program Element #0603363F, Armament Technology Integration
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ in thousands): Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

	FY
1. (U) Start ICAAS aircraft modifications	4 Qtr 1990
2. (U) Complete AFTI F-16 night and under the weather mods	1 Qtr 1991
3. (U) Demo AFTI F-16 single seat night/under the weather attack capability	4 Qtr 1991
4. (U) Start ICAAS 1vs4 flight test	1 Qtr 1992
5. (U) Start ICAAS wingman aircraft mods	1 Qtr 1992
6. (U) Complete ICAAS 1vs4 flight testing	3 Qtr 1992
7. (U) Start ICAAS internetted (2vs4) flight testing	4 Qtr 1992
8. (U) Complete AFTI F-16 FLIR flight tests	4 Qtr 1992
9. (U) Complete ICAAS 2vs4 flight testing	2 Qtr 1993
10. (U) Complete special operations, transport, and tactical aircraft cockpit integration and checkout	4 Qtr 1993

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603250F Project Number: 649L
PE Title: Lincoln Laboratory Budget Activity: #2-Advanced Technology Dev.

A. (U) RESOURCES ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Lincoln Laboratory	22,997	26,863	27,891	27,986	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Lincoln Laboratory Program is a high-technology research and development effort conducted through a cost reimbursable contract with the Massachusetts Institute of Technology. Lincoln Laboratory is operated as a Federal Contract Research Center (FCRC) administered by the Department of Defense. Lincoln Laboratory provides advanced research and technology demonstration in military satellite communications, space radar technology, space-based visible surveillance, deep-space and tactical battlefield surveillance, and advanced solid-state devices, materials and processing technology. The Laboratory continues to be a leader in providing critical enabling technologies for advanced space surveillance and communication systems and ensures that the Air Force maintains its technology leadership role in advanced electronics.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Developed Gallium Arsenide (GaAs) permeable based transistor (PBT) producing 20 GHz power in monolithic microwave integrated circuit for advanced space communications.
   - (U) Developed charge-coupled-device (CCD) imagers hardened to 0.6 Mrad for surveillance and intelligence applications.
   - (U) Design completed and wafers fabricated for 1.7-billion operations-per-second wafer-scale jammer nulling processor for space and airborne radars.
   - (U) First phase of 200 Mbit wafer-scale memory demonstrated.
   - (U) Developed performance limits and algorithms for geolocation and for separation of unknown cochannel emitters in the presence of antenna array and receiver response errors for intelligence systems.
   - (U) Flight qualified laser transmitter and diagnostic module for Lasercom satellite and completed crosslink engineering model.
   - (U) Began performance evaluation of space-based radar test beds and articles for subsequent end-to-end system ground test.
   - (U) Evaluated airborne active/passive sensor for detection of tactical & strategic targets in foliage & camouflage.

2. (U) FY 1991 Planned Program:
   - (U) Develop and demonstrate large area CCD imagers in infrared and ultraviolet bands for space surveillance.
   - (U) Demonstrate platinum silicide Schottky-barrier infrared (IR) detector array (400x400 pixels) for space surveillance.

Program Element: #0603250F Project Number: 649L
PE Title: Lincoln Laboratory Budget Activity: #2-Advanced Technology Dev.

- (U) Demonstrate generic two-layer CCD neural network chips for automated image recognition processing tasks.
- (U) Restructure jammer nulling wafer and incorporate into demonstration system for space-based radar.
- (U) Fabricate 0.3 micron transistors in ultrathin silicon on insulator (SOI) using 193 nanometer excimer laser lithography.
- (U) Demonstrate 100 mega-rad hardness by combining reoxidized nitrited oxide (RNO) with thic. SOI for space applications.
- (U) Implement a parallel processing version of experimental target recognition system (XTRS) on model MX-1 processor for tactical and strategic relocatable target (SRT) applications.
- (U) Evaluate optical communication links in a shared memory multiprocessor interconnect network for parallel processors.
- (U) Design and implement real-time stripmap synthetic aperture radar (SAR) for stationary target detection.
- (U) Continue flight qualification testing of subsystems and integration/ testing of Lasercom crosslink engineering model.
- (U) Complete construction of high throughput wafer-scale processor and a space-based radar processor test bed.

3. (U) FY 1992 Planned Program:
   - (U) Demonstrate greater-than-one-million pixels multichip CCD focal plane imagers hardened to 1 Mrad for space surveillance.
   - (U) Demonstrate two and three terminal high-temperature thin-filmsuperconductive devices for high-speed signal processing.
   - (U) Embed CCD neural network chips into neural network signal processor for self learning signal processing development.
   - (U) Fabricate arrays of integrated electronic and optical components for implementation of early-vision neural network.
   - (U) Demonstrate real-time stripmap SAR mode radar presentation.
   - (U) Develop direction finding techniques and algorithms to exploit waveforms and enhance performance at low signal-to-noise ratios for signal intelligence applications.
   - (U) Complete flight qualification of subsystems and integration and testing of Lasercom satellite crosslink engineering model.
   - (U) Continue technology extension program to create modular, easily integratable Lasercom systems.
   - (U) Continue integrated testing of space-based radar testbeds.
   - (U) Begin development of arrays and processors for an absolute ranging down-looking laser radar with wide angle coverage.

4. (U) FY 1993 Planned Program:
   - (U) Fabricate hybrid high-speed circuits combining high-temperature thin-film superconductor components with semiconductor devices.
   - (U) Demonstrate CCD neural network signal processor for pattern recognition of classes of targets.
   - (U) Demonstrate opto-electronic implementation of subsystem of early-vision neural network for automatic target recognition.
   - (U) Detailed design of application-specific wafer-scale memory in collaboration with domestic dynamic random access memory (dRAM) manufacturer.

Program Element: #0603250F Project Number: 649L
PE Title: Lincoln Laboratory Budget Activity: #2-Advanced Technology Dev.

- (U) Implement real-time high-resolution SAR imaging mode and start implementation of stationary target identification algorithms.
- (U) Develop advanced visible and medium-wave IR (MWIR) focal plane sensors using advanced algorithms for space surveillance.
- (U) Conduct sensor technology tests in actual space surveillance environments at Lincoln's Experimental Test System (ETS).
- (U) Begin construction of a down-looking absolute ranging laser radar and real-time processor.
- (U) Build a flyable preprocessor based on the neural network optimization chip to detect and identify concealed targets.
- (U) Continue data collection using the flyable sensor suite against low observable targets.

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

D. (U) WORK PERFORMED BY: There are no prime contractors that support this program. Funds are used to pay salaries and purchase supplies for in-house activities at Lincoln Laboratory.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Not Applicable.
2. (U) SCHEDULE CHANGES: Not Applicable.
3. (U) COST CHANGES: Not Applicable.

F. (U) PROGRAM DOCUMENTATION: 1951, MIT Lincoln Laboratory FCRC Charter; May, 1975, Department of Defense Plan for Administration of Lincoln Laboratory.

G. (U) RELATED ACTIVITIES:
(U) PE 0303603F, Milstar Satellite Communications System.
(U) PE 0602702F, Command, Control and Communications.
(U) PE 0102424F, SPACETRACK.
(U) PE 0102428F, Space Surveillance Technology.
(U) PE 0303401F, Communications Security.
(U) PE 0601102F, Defense Research Science.
(U) PE 0601101F, In-House Laboratory Independent Research.
(U) PE 0602301E, Wafer-Scale Integration.
(U) PE 0603789F, Command, Control, Communications and Intelligence.
(U) There is no unnecessary duplication of effort within the AF or DOD.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603253F Budget Activity: #2-Advanced Technology Development

PE Title: Advanced Avionics Integration

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
666A, Advanced Reference Systems Development	3,068	2,400	3,096	3,448	Cont	TBD
2733, Advanced Reconnaissance/Strike Radars	3,978	6,873	8,142	9,011	Cont	TBD
2735, Advanced Systems Avionics Applications	4,462	2,724	4,623	5,684	Cont	TBD
3833, Sensor Integration for Covert Penetration	2,030	3,082	3,669	4,383	Cont	TBD
Total	13,538	15,079	19,530	22,526	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element develops technology to improve radar and navigation systems, improve avionics supportability and integration, and apply these and other technologies to covert mission operations. For example, the radar project is studying motion compensation techniques that address the documented problem of image smearing in synthetic aperture radar during turbulent flight conditions. At the same time the project is laying the technical ground work for a foliage penetration radar to find camouflaged/hidden targets (Scud-like missile systems). Reference systems (navigation) has three thrusts to develop and improve navigation systems: solid state inertial elements, stellar inertial elements, and providing jam resistance to NAVSTAR Global Positioning System (GPS) receivers. The other two projects focus on technology insertion or system concepts. Advanced System Avionics Applications has been responsible for the revolution in avionics through such programs as DAIS and Pave Pillar. It is now providing the technology base for a new generation of highly reliable and easily maintained avionics, and advanced digital processors including development of an artificial intelligence processor for aircrew aiding/situation awareness. Sensor Integration for Covert Penetration is applying technologies improve the capabilities of SOF aircraft to penetrate hostile airspace.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project: 666A, Advanced Reference Systems Development: Tactical aircraft survival and precise weapon delivery require accurate and reliable navigation systems. This project develops navigation sensors, integration techniques, and software to improve the accuracy and availability of navigation information for future weapon systems. Major technology thrusts are jam resistant navigation receivers; multi-function antenna systems that combine communications, navigation, and electronic warfare functions; and reliable strapdown stellar inertial systems.

(U) FY 1990 Accomplishments:

Program Element: #0603253F Budget Activity: #2-Advanced Technology Development
PE Title: Advanced Avionics Integration

- (U) Developed breadboard Global Positioning System (GPS)signal processor providing 30 dB anti-jam capability improvement.
- (U) Designed joint AF/Navy strapdown stellar inertial system to reduce unit production cost to one fifth of current systems.
- (U) Conducted a joint design program with Navy to reduce the number of antennas on aircraft.

(U) FY 1991 Planned Program:
- (U) Lab test anti-jam GPS breadboard receivers to quantify improved ECCM capability.
- (U) Complete strapdown stellar inertial system brassboard design.

(U) FY 1992 Planned Program:
- (U) Perform breadboard testing on critical 2MHz-6GHz antenna subsystems for communication, identification and navigation.
- (U) Demonstrate daylight stellar tracker wide angle lens to evaluate proof of concept, eliminating costly mechanical gimbals.
- (U) Design an ultra-high reliability inertial measurement unit for aerospace vehicles.

(U) FY 1993 Planned Program:
- (U) Fabricate strapdown stellar inertial platform for lab test.
- (U) Demonstrate flyable 2MHz-6GHz antenna brassboard with Navy to establish performance capabilities.
- (U) Fabricate an ultra-high reliability inertial measurement to provide failure free life matching airframe structural life.

(U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB OH manages this project. Major contractors are: TRW, San Diego CA; Northrup, Hawthorne CA; and C.S. Draper Laboratory, Cambridge MA.

(U) Related Activities:
(U) PE 0602204F, Aerospace Avionics.
(U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
(U) PE 0305164F, NAVSTAR Global Positioning System.
(U) PE 0603217N, Advanced Aircraft Subsystems
(U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project: 2733, Advanced Reconnaissance/Strike Radars: Current capability to detect and acquire concealed or camouflaged targets is limited. Improvements in low observable (LO) and camouflage, concealment, and deception techniques require improvements in airborne radar capabilities. This project develops radar technologies for detection and targeting of ground targets. This project is developing acquisition and adaptive processing techniques for detecting airborne targets in difficult background conditions.

Program Element: #0603253F Budget Activity: #2-Advanced Technology Development
PE Title: Advanced Avionics Integration

(U) FY 1990 Accomplishments:
- (U) Developed improved motion compensation techniques for synthetic aperture radars to improve imaging in mild turbulence.
- (U) Developed concept for wide area, air-to-surface, search and cuing radar for detection of concealed/camouflaged targets.

(U) FY 1991 Planned Program:
- (U) Combine model-based vision algorithms with parallel processing to provide synthetic aperture radar automatic target recognition (ATR) capability.
- (U) Test motion compensation techniques in turbulent high maneuver flight regimes.

(U) FY 1992 Planned Program:
- (U) Design unique foliage penetration radar brassboard capable of reliably detecting hidden/camouflaged targets (such as Scuds).
- (U) Laboratory test all-weather, near real-time target recognition capability.
- (U) Develop a simulation capability that will allow inexpensive validation of new motion compensation techniques prior to flight test.

(U) FY 1993 Planned Program:
- (U) Laboratory demonstration of near real-time radar automatic recognition of ground targets.
- (U) Fabricate and test a flyable wide area, air-to-surface search and cuing radar brassboard capable of reliably detecting hidden/camouflaged relocatable targets.
- (U) Develop techniques for detecting LO airborne targets in high clutter/noise environments.

(U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB, OH manages this project. Contractors include: Martin Marietta, Denver CO; Westinghouse, Baltimore MD; Loral Systems, Litchfield Park AZ; and ERIM, Ann Arbor MI.

(U) Related Activities:
(U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
(U) There is no unnecessary duplication of effort in the Air Force or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project: 2735, Advanced Systems Avionics Applications: The new approach to the design of avionics emphasizes integration, highly reliable fault tolerant operation, and increased performance at lower cost. This project will focus on applying technologies to demonstrate integrated avionics architectures and core processors, highly reliable

avionics, and improved packaging and cooling. The objective is to reduce avionics support costs, increase sortie rates from bare bases, and provide affordable high speed signal processing.

(U) FY 1990 Accomplishments:
- (U) Studied opportunities to improve reliability and cost of ownership of next generation avionics.
- (U) Defined engineering productivity tools for modular avionics maintenance.

(U) FY 1991 Planned Program:
- (U) Complete Pave Pace concept studies, defining avionics technology roadmaps to insert integrated sensors, parallel processing, photonics, and real-time software into aircraft.

(U) FY 1992 Planned Program:
- (U) Design ultra-reliable digital and RF modules capable of operating for 50,000 hours before failure.
- (U) Demonstrate modular avionics maintenance technology to reduce false maintenance actions by 50%.
- (U) Apply DARPA's ALADDIN high speed 32 bit processor module to avionics systems.

(U) FY 1993 Planned Program:
- (U) Design ultrareliable digital and RF modules and a light weight integrated rack to meet R&M 2000 limited support environment.
- (U) Deliver of real-time artificial intelligence system brassboard to augment DARPA Pilot's Associate in areas such as automatic targeting.
- (U) Demonstrate high speed gallium arsenide sensor preprocessor to improve status reporting to the aircrew.

(U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB OH manages this project. Contractors include: TRW, Dayton OH; Research Triangle Institute, Durham NC; Lockheed, Burbank CA; McDonnell Douglas, St Louis MO; and Boeing, Seattle WA.

(U) Related Activities:
(U) PE 0602204F, Aerospace Avionics.
(U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
(U) DARPA Pilot's Associate Program and ALADDIN Processor.
(U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project: 3833, Sensor Integration for Covert Penetration: Most current avionics suites produce radio frequency emissions that provide the pilot with mission performance information but also reveal the

Program Element: #0603253F Budget Activity: #2-Advanced Technology Development
PE Title: Advanced Avionics Integration

presence of the aircraft. These emissions limit covert penetration. This project supports laboratory and flight demonstration of the system technologies to provide current and future airborne weapon systems with significant new capabilities to penetrate areas without detection. Efforts concentrate on nap-of-the-earth flight in day or night with reduced emission, real-time integrated threat detection/avoidance, low probability of intercept (LPI) communication, and sensor management for data fusion.

(U) FY 1990 Accomplishments:
- (U) Flight demonstrated digital map aided navigation.
- (U) Initiated preliminary design efforts for an affordable avionics suite for an advanced transport aircraft.

(U) FY 1991 Planned Program:
- (U) Improve penetration of Special Operations aircraft through low probability of intercept communication and real-time threat avoidance.
- (U) Begin Constant Source flight demonstration with Navy for real-time mission replanning.

(U) FY 1992 Planned Program:
- (U) Test integrated threat avoidance and laser obstacle avoidance.
- (U) Demonstrate efficient data fusion algorithms for threat identification and location using existing sensors.
- (U) Evaluate a distributed Kalman filter for robust navigation.

(U) FY 1993 Planned Program:
- (U) Demonstrate on laboratory simulator an improved F-16 data modem.
- (U) Demonstrate real-time electronic support measures threat update capability.

(U) Work Performed By: This Project is managed by the Wright Laboratory, Wright-Patterson AFB OH. Contractors include TRW, Dayton OH; Rockwell International, Anaheim CA; McDonnell Douglas, Long Beach CA; Lockheed, Ontario CA.

(U) Related Activities:
(U) PE 0602204F, Aerospace Avionics.
(U) PE 0603737D, Balanced Technology Initiative.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603260F Budget Activity: #4 - Tactical Programs
PE Title: Intelligence Advanced Development (IAD)

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3479 Advanced Sensor Exploitation	1,346	634	1,000	1,600	Cont	TBD
3480 Automated Imagery Exploitation	1,845	750	1,338	2,209	Cont	TBD
3481 Knowledge Based Technology for Intelligence	1,724	1,990	2,194	2,432	Cont	TBD
3482 Scientific & Technical Intelligence Methodologies	1,192	860	965	1,581	Cont	TBD
Total	6,107	4,234	5,497	7,822	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Develops and demonstrates advanced technology for intelligence systems capabilities and techniques which support tactical/strategic combat commanders and National Command Authorities (NCA) needs for timely, all-source intelligence information. Objectives are: to develop improved analytical techniques and training systems to support USAF warfighting missions; expand and improve intelligence data storage, retrieval and handling; and to satisfy needs for near-real-time data processing, exploitation and dissemination from current and future advanced sensors. This will improve the accuracy and timeliness of intelligence information provided to military and national decision makers, thereby increasing warning/reaction time in crisis situations.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 3479, Advanced Sensor Exploitation (ASE): Develops near-real-time, all-source intelligence information through receipt, correlation and fusion of multi-source intel data using expert systems. It utilizes templating and analysis of sensor data to provide an assessment of events in an area of interest; and make informed assessments/predictions of future enemy courses of action, thereby providing the basis for better utilization of assets.

(U) FY 1990 Accomplishments:
- (U) Developed dynamic templating capability for target recognition.
- (U) Developed enhanced/integrated ASE correlation/fusion capability.
- (U) Completed analysis of intelligence data requirements for the Advanced Mission Planning System.

Program Element: #0603260F Budget Activity: #4 - Tactical Programs
PE Title: Intelligence Advanced Development (IAD)

- (U) Completed development of a correlation/fusion evaluation module.
- (U) Completed design for the low intensity conflict intelligence processor.

(U) FY 1991 Planned Program:
- (U) Expand Rapid Application of Airpower (RAAP) baseline functional capability to provide an interactive prototype for operational testing; and, integrate RAAP predictive intelligence algorithms into the Limited Operational Capability Europe (LOCE) facility.
- (U) Investigate applicability of ASE correlation/fusion and RAAP algorithms to the Contingency TACS Automated Planning System (CTAPS).

(U) FY 1992 Planned Program:
- (U) Continue RAAP enhancements directed toward development of a full scale prototype.
- (U) Complete ASE and RAAP correlation/fusion model for CTAPS.

(U) FY 1993 Planned Program
- (U) Initiate efforts to incorporate advanced reasoning and neural network technologies into the correlation/fusion process.
- (U) Complete development of RAAP full scale prototype.

(U) Work Performed By: The program is managed by Air Force Systems Command (AFSC), Andrews AFB, MD, with project efforts conducted by the Rome Lab (RL), Griffiss AFB, NY. The major contractors involved include: PAR Technologies, Inc., New Hartford, NY; Synectics Corp., Fairfax, VA; Control Data Corp., Minneapolis, MN; GTE, Mountain View, CA; Delfin Systems, Sunnyvale, CA; Language Systems, Woodland Hills, CA; E-Systems, Garland, TX; and, BDM Corp., McClean, VA.

(U) Related Activities:
- (U) Program Element #0604750F, Intelligence Equipment.
- (U) Program Element #0602702F, Command, Control, and Communications.
- (U) Program Element #0102310F, WWMCCS ADPNORAD.
- (U) Program Element #0207412F, Tactical Air Control System Improvements.
- (U) Program Element #0207431F, Tactical Air Intelligence Systems.
- (U) Program Element #0604321F, Joint Tactical Fusion Program.
- (U) Program Element #0207435F, Tactical Imagery Processing, Exploitation, and Dissemination.
- (U) Program Element #0303152F, WWMCCS Information System.
- (U) Program Element #0603208F, Reconnaissance Sensor Development.
- (U) Program Element #0603789F, Command, Control & Communications Advanced Development.
- (U) Program Element #0603726F, C^3I Subsystems Integration.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

Program Element: #0603260F Budget Activity: #4 - Tactical Programs
PE Title: Intelligence Advanced Development (IAD)

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3480, Automated Imagery Exploitation (AIE): Develop and demonstrate technology advancements required for real/near-real-time multi-source/multi-imagery exploitation in a ground station environment. AIE is divided into four areas: Image Interpretation, Target Graphics, Target Location, and Exploitation systems. These advanced technologies in expert systems will assist the image interpreter and reconnaissance technicans in target detection, classification, and identification through semi-automated and automated data handling and interpretation by augmenting human intelligence in the manpower intensive task of imagery analysis.

(U) FY 1990 Accomplishments:
- (U) Developed initial capability for automated production of terminal homing devices.
- (U) Completed Imagery Exploitation 2000 (IE2000) concept formulation including improved man-machine interface (MMI) and advanced algorithms and display methods to aid the photo interpreter.
- (U) Demonstrated Digital Geopositioning System to TAC and USAFE.
- (U) Completed Imagery Information Reformatter (I2R) coordination with France.
- (U) Completed target graphics generation capability for intelligence reporting and mission planning.

(U) FY 1991 Planned Program:
- (U) Develop, implement and demonstrate IE2000 capability to interface softcopy workstations with new sophisticated windowing capabilities, image processing tools, and cartographic/ geographic information.
- (U) Complete three dimensional advanced reference scene generation capability for long range conventional stand-off weapons.
- (U) Initiate US/France cooperative effort for I2R.
- (U) Test and evaluate the Semi-Automated, Multi-Sensor, Multi-Spectral Exploitation (SAMME) capability, started in FY89, within the IE2000 testbed.

(U) FY 1992 Planned Program:
- (U) Complete evaluation of semi-automated imagery exploitation model.
- (U) Complete implementation of IE-2000 and initiate special applications programs.
- (U) Continue US/France cooperative effort for I2R.

(U) FY 1993 Planned Program:
- (U) Incorporate fully automated imagery exploitation technology into IE2000.
- (U) Conduct IE2000 user evaluations in an operational environment.
- (U) Initiate application of neural network technology into end to end image processing environment.

Program Element: #0603260F Budget Activity: #4 - Tactical Programs
PE Title: Intelligence Advanced Development (IAD)

(U) Work Performed By: See Project 3479.

(U) Related Activities: See Project 3479.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Currently negotiating with NATO for the Imagery Information Reformatter (I2R).

3. (U) Project 3481, Knowledge Based Technology for Intelligence: Development of advanced computer software based on artificial intelligence techniques. The increased timeliness, efficiency and effectiveness derived will provide more warning time and accuracy, allowing national/military authorities a greater range of options to avert, diminish or control a crisis.

(U) FY 1990 Accomplishments:
- (U) Delivered the Electronic Warfare Flagging System to AFEWC.
- (U) Initiated a program for machine aided voice translation.
- (U) Developed a trans-launch rule base and mission payload assessment capability for Indications and Warning (I&W).
- (U) Developed a time line analysis system for event situation assessment.

(U) FY 1991 Planned Program:
- (U) Deliver the Tactics Analysis Expert System to ESC.
- (U) Complete the expert system for countering denial and deception techniques associated with mobile missiles.
- (U) Complete feasibility studies for machine aided voice translation.
- (U) Expand the Tactics Analysis program to include event categorization.
- (U) Expand knowledge base for I&W Expert System.

(U) FY 1992 Planned Program:
- (U) Demonstrate a full service query support process from multiple, heterogeneous intelligence data bases.
- (U) Build a generic message parsing system to automatically decompose fixed format messages for a multitude of intelligence users/applications.
- (U) Develop Space I&W Expert System.

(U) FY 1993 Planned Program:
- (U) Apply pattern recognition neural network technology to the exploitation and processing of intelligence data.
- (U) Implement full-up natural language understanding capability for intelligence data processing.

(U) Work Performed By: See Project 3479.

(U) Related Activities: See Project 3479.

Program Element: #0603260F Budget Activity: #4 - Tactical Programs
PE Title: Intelligence Advanced Development (IAD)

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 3482, Scientific and Technical Intelligence Methodologies: The objective is to conduct research on intelligence methodologies and develop operational employment simulation models to satisfy Air Force Foreign Technology Division (FTD) requirements. Technologies developed under this project will enable FTD to improve their analysis of current and future foreign weapons systems, and prevent technological surprise with regard to the capabilities of these systems.

(U) FY 1990 Accomplishments:
- (U) Delivered the ELINT Analysis Expert system.
- (U) Completed the Scientific and Technical Reporting Information Processing System (STRIPS) specification to improve on-line merging of S&T intelligence data during imagery exploitation.

(U) FY 1991 Planned Program:
- (U) Develop an expert system to assist the FTD intelligence analyst in extracting and collating data required for detailed analysis.
- (U) Continue the development of an expert system for analyzing Cobra series sensor data.

(U) FY 1992 Planned Program:
- (U) Complete development of the system to analyze Cobra data.
- (U) Continue development of the radar data base extraction tool.

(U) FY 1993 Planned Program:
- (U) Develop a set of automated tools to integrate and couple computer models between various branches at FTD.
- (U) Complete the radar analyst assistant task.
- (U) Continue the development of the tool set to assist in the management of models and simulations.
- (U) Incorporate solid modeling tools into the assessment of foreign aircraft.

(U) Work Performed By: See Project 3479.

(U) Related Activities: See Project 3479.

(U) Other Appropriated Funds: Not Applicable.

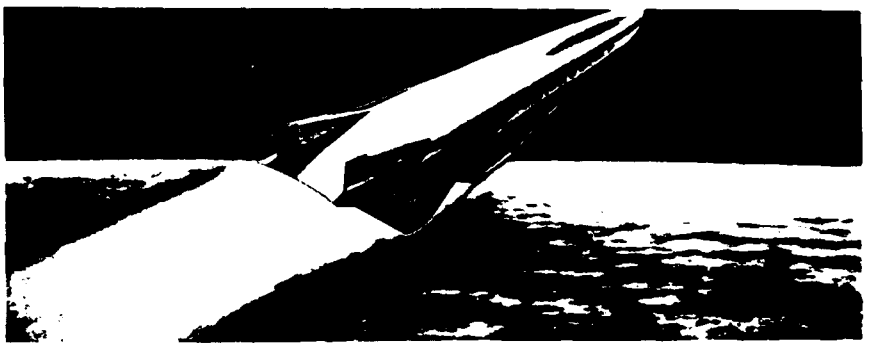
(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0603269F
PE Title: National Aero-Space Plane (NASP) Technology Program

Project: # 3384
Budget Activity: # 2 - Advanced Technology Development

Project Title: NASP Technology Program



POPULAR NAME: X-30, NASP

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Propulsion	61,213	56,316	76,600	42,300	TBD
Airframe	26,780	23,697	81,600	29,700	TBD
Tech Mat & Matl's	79,581	65,387	30,000	15,000	TBD
Applications	3,513	2,600	2,100	4,800	TBD
X-30 Aero-Spacecraft	0	0	0	70,000	TBD
Support Contract	1,147	750	4,900	4,500	TBD
In-House Support	6,491	4,250	5,900	5,700	TBD
GFE/Other	13,376	8,537	30,733	11,289	TBD
Total [1]	192,101	161,537	231,833	183,289	TBD
SCHEDULE	FY 1990	FY 1990	FY 1992	FY 1993	(To Complete)
Program Milestones	Complete Phase IIC	Start Phase IID - Oct	Continue Phase II	Start Phase III	Complete Phase III
Engineering Milestones	Begin composite config. def.	Final composite config. def	Continue design activities	Phase III decision	Design and build X-30
T&E Milestones	NA	NA	NA	NA	Flight Testing
Contract Milestones	Continue Phase II	National Team IID	Continue Phase II	Start Phase III	Complete Phase III

Note 1: Detailed funding breakouts shown above the "total" line represent a pro-rata DoD share of joint DoD/NASA program. Total Program for FY90 is $254M, FY91 is $258M, FY92 is $305M, and FY93 is $300M.

Program Element: # 0603269F
PE Title: National Aero-Space Plane (NASP) Technology Program

Project: # 3384
Budget Activity: # 2 - Advanced Technology Development

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
This program element funds the DoD portion of the joint Presidentially-directed (reaffirmed and updated in July, 1989) DoD/NASA technology development and demonstration program for a National Aero-Space Plane (NASP). The goal of the NASP program is to develop the technological basis for runway-launched space transportation vehicles capable of single-stage-to-orbit and for aircraft capable of hypersonic flight in the atmosphere. The technologies are planned to be demonstrated in a flight research vehicle, the X-30, which is envisioned to be an airbreathing, hydrogen-fueled, single-stage-to-orbit experimental vehicle capable of operating (horizontal takeoff/landing) from conventional runways. Following successful demonstration, the technologies will provide the basis for military and civil vehicles capable of: global unrefueled operation, reaching any point on the globe in two hours or less; providing routine, "on demand" access to near space; reducing payload-to-orbit cost by an order of magnitude; and flexibly based, rapid response space launch. Future NASP-derived vehicles (NDVs) could satisfy existing validated statements of need and would provide revolutionary increases in military capability and help the U.S. maintain its world leadership position in aerospace.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
- (U) Formed national contractor team
- (U) Conducted inlet test for engine and airframe configurations
- (U) Initiated low speed freejet engine tests (Mach 0-2.7)
- (U) Conducted subscale freejet ramjet and scramjet tests
- (U) Completed first round of aerodynamic wind tunnel tests, defining lift/drag, stability and control, and aero-heating characteristics
- (U) Completed trade studies on six alternative designs to achieve reuseable single-stage-to-orbit vehicles
- (U) Conducted materials characterization tests and manufacturing technology demonstrations of selected high temperature capable, lightweight, high strength materials
- (U) Conducted engine base burning tests and freejet simulation
- (U) Fabricated/initiated testing airframe structural demonstration articles (cryogenic tanks, wing/fuselage attachment structure, and actively cooled panels)
- (U) Established teamed baseline configuration for X-30 vehicle and engine

2. (U) FY 1991 Planned Program:
- (U) Complete first and second design cycles of selected X-30 configuration
- (U) Test airframe aerodynamic wind tunnel models based on selected X-30 configuration
- (U) Design/initiate fabrication of airframe structural demonstration articles based on selected X-30 configuration
- (U) Complete testing on tank and fuselage structural articles

Program Element: # 0603269F
PE Title: National Aero-Space Plane (NASP) Technology Program
Project: # 3384
Budget Activity: # 2 - Advanced Technology Development

- (U) Continue design/fabrication of module-to-module engine test rig
- (U) Complete initial module-to-module engine test rig tests
- (U) Continue low speed engine performance tests
- (U) Complete 3-D tests of external burning
- (U) Conduct operability and supportability studies to identify design drivers which enable low cost, on-demand access to space
- (U) Complete design of concept demonstration engine
- (U) Make final decision on use of slush hydrogen as X-30 fuel. Initial test phase positive--slush successfully produced, aged, and transferred

3. (U) FY 1992 Planned Program:
   - (U) Complete small structural article tests
   - (U) Complete fabrication of large structural articles
   - (U) Complete Phase III cost estimate
   - (U) Fabricate and initiate tests for concept demonstration engine
   - (U) Complete 3rd and 4th design cycles of selected X-30 configuration
   - (U) Complete preliminary design review for experimental demonstration engine

4. (U) FY 1993 Planned Program:
   - (U) Complete 5th design cycle
   - (U) Conduct Systems Design Review of X-30
   - (U) Complete Phase II engine and airframe testing and analyze final development data
   - (U) Complete large structural article tests
   - (U) Phase III (build and flight test X-30) decision
   - (U) Initiate preliminary design review of X-30

5. (U) Program to Completion:
   - (U) Complete Preliminary Design Review
   - (U) Conduct Critical Design Review
   - (U) Complete detailed design effort
   - (U) Fabricate, checkout, and test two X-30 flight research aircraft
   - (U) Conduct flight envelope clearance test
   - (U) Demonstrate research objectives met
   - (U) Complete assessment of operational utility and applications to provide data on the use of NASP technologies in potential operational follow-on vehicles

D. (U) Work Performed By: This is a joint DoD/NASA program. The Air Force has overall responsibility. A Joint Program Office at Wright-Patterson AFB, Ohio, executes the program. Technology development is being conducted by contractors, universities and DoD and NASA laboratories and centers. Contractors for engine development are Pratt and Whitney, West Palm Beach, FL, and Rocketdyne, Canoga Park CA. Airframe design and component development contractors are General Dynamics, Fort Worth, TX, McDonnell Douglas, Saint Louis, MO, and Rockwell, Downey, CA. The contractors formed a national team in May, 1990, and are now pursuing a single X-30 airframe and engine design.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

Program Element: # 0603269F
PE Title: National Aero-Space Plane (NASP) Technology Program

Project: # 3384
Budget Activity: # 2 - Advanced Technology Development

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: None
3. (U) COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION:
- (U) SAC SON 07-79, Jun 79
- (U) AFSPACECOM SON 06-84, Mar 86
- (U) Memorandum of Agreement for NASP (AF/Navy/SDIO/DARPA), 25 April 1986
- (U) DoD/NASA Memorandum of Understanding, 27 Sep 1988
- (U) SAC/AFSPACECOM Memorandum of Agreement, 27 Nov 1990

G. (U) RELATED ACTIVITIES:
- (U) NASP is a joint DoD/NASA program. Participation among DoD organizations is governed by a Memorandum of Agreement (MOA), signed by all Services/Agencies and by the Under Secretary of Defense for Research and Engineering, dated 25 Apr 1986.
- (U) Relationship between DoD and NASA is governed by a Memorandum of Understanding (MOU), signed by the Secretary of Defense and the NASA Administrator, dated 27 Sep 1988.
- (U) Broad programmatic policy and direction are provided to the NASP program by the NASP Steering Group, chaired by the Under Secretary of Defense (Acquisition) with the NASA Deputy Administrator as Vice-Chairman. All other participating organizations have members. The Director, White House Office of Science and Technology Policy is an ex-officio member. The NASP Steering Group approves all changes in program goals, objectives, funding and schedules.
- (U) DoD Phase III funding (FY94-97) established at $100M/yr as "placeholder" to be adjusted based on Phase II progress.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results

See Section C. for testing accomplished on airframe and engine components.

T&E ACTIVITY (TO COMPLETION)

Event	Planned Date	Remarks
Submit Research Plan	2Q/FY1993	Start of Phase III
X-30 First Atmospheric Flight	4Q/FY1997	Start of flight research program to demonstrate NASP technologies
X-30 First Orbital Flight	4Q/FY1999	First demonstration of the ultimate NASP program goal

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603270F
PE Title: Electronic Combat Technology

Budget Activity: #2 Advanced Technology Development

A. (U) RESOURCES ($ In Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2222 Electro-Optical Countermeasures	765	716	1,401	3,575	Cont	TBD
2432 Warning & Avoidance Receiver Systems Technology	8,969	15,042	16,673	13,373	Cont	TBD
2754 C3 Countermeasures Technology	276	832	1,100	2,579	Cont	TBD
431G Infrared Countermeasures	11,835	8,888	5,768	7,559	Cont	TBD
691X Radio Frequency Countermeasures	9,630	9,208	10,903	12,725	Cont	TBD
Total	31,475	34,686	35,845	39,811	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Electronic Combat technology program element is an ongoing advanced development program to expand the electronic warfare (EW) technology base by performing proof of design concepts and demonstrating technologies to support critical USAF EW requirements. The projects are categorized by the development of components, subsystems, and technology demonstrators that have potential applications to satisfy tactical, strategic and airlift EW requirements and to reduce acquisition and life cycle costs of EW systems. The program includes the development and demonstration of Radio Frequency (RF), Infrared (IR), Electro-optical (EO) and Command, Control, and Communication (C3) countermeasure technologies. In addition, signature reduction, advanced EW transmitters, receivers, and power management technologies and concepts are developed and demonstrated. Exploitation of foreign airborne and land-based threat systems continues to show major improvements have been made to these systems. This program will ensure a strong EW technology base is available to provide demonstrated counters to current and future threat capabilities.

Program Element: #0603270F
PE Title: Electronic Combat Technology

Budget Activity: #2 Advanced Technology Development

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2222, Electro-Optical Countermeasures (EOCM): This project develops technologies for detecting and countering optical and television (TV) directed threats against strategic, airlift and tactical aircraft.

(U) FY 1990 Accomplishments:
- (U) Completed the Coronet Prince

(U) FY 1991 Planned Program:
- (U) Define the technical requirements tc

(U) FY 1992 Planned Program:
- (U) Develop the approach to implement the EO smart skin technology for airborne applications.
- (U) Study the Turbulent Interaction model to predict propagation of laser beams through engine exhaust plume, and aircraft turbulent wake.
- (U) Design a frequency agile laser to improve reliability and maintainability for EOCM sources. Working with DARPA to ensure non-redundancy of research. Coordinated with & non-duplicative of DARPA diode pumped solid state laser development.

(U) FY 1993 Planned Program:
- (U) Design a laser warning system using a single aperture interferometer detection approach.
- (U) Design validation experiments for the Turbulent Interaction Model.

(U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB, OH manages this effort. Contractors include Westinghouse, Baltimore, MD.

(U) Related Activities:
(U) Program Element 0602204F, Aerospace Avionics.
(U) Program Element 0604270F, EW Development.
(U) The Joint Director of Laboratories/Technical Panel on Electronic Warfare coordinates this effort with other services.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not applicable.

Program Element: #0603270F
PE Title: Electronic Combat Technology

Budget Activity: #2 Advanced Technology Development

(U) International Cooperative Agreements: Under the Information Exchange Program (IEP-D-81-UK3)

2. (U) Project 2754, C3 Countermeasures Technology: This project develops and demonstrates technologies to counter hostile Command, Control, and Communications (C^3) systems. Program emphasis is or

(U) FY 1990 Accomplishments:
- (U) Demonstrated
- (U) Demonstrated applications.

(U) FY 1991 Planned Program:
- (U) Demonstrate techniques to

(U) FY 1992 Planned Program:
- (U) Study techniques to
- (U) Demonstrate a system to
- (U) Extend data fusion techniques for

(U) FY 1993 Planned Program:
- (U) Study design alternatives
- (U) Design and fabricate breadboard hardware to
- (U) Finish testing data fusion techniques

(U) Work Performed By: This project is managed by Wright Laboratory, Wright-Patterson AFB, OH. Contractors include: Magnovox, Ft Wayne, IN, and Harris, Melborne, FL, Hazeltine Corp, Long Island, NY.

(U) Related Activities:
(U) Program Element 0602204F, Aerospace Avionics.
(U) Program Element 0604270F, EW Development

Program Element: #0603270F
PE Title: Electronic Combat Technology

Budget Activity: #2 Advanced Technology Development

(U) The Joint Director of Laboratories/Technical Panel for Electronic Warfare coordinates this effort with the other services.

(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not applicable.

(U) International Cooperative Agreements: None.

3. (U) Project 431G, Infrared (IR) Countermeasures: This project develops and demonstrates advanced hardware and techniques to counter hostile air and ground threats that operate in the IR spectrum. This project develops countermeasures to established threats as well as future technological advances.

(U) FY 1990 Accomplishments:
- (U) Terminated the HAVE GLANCE, laser based Infrared Countermeasure (IRCM) development program due to technical and program execution risks.
- (U) Ground tested the Silent Attack Warning System (SAWS), a passive missile warning system that has potential tactical, strategic, and airlift applications.

(U) FY 1991 Planned Program:
- (U) Flight test SAWS to establish range performance as well as false alarm characteristics.
- (U) Demonstrate laser rangefinder countermeasures in cooperation with British government.

(U) FY 1992 Planned Program:
- (U) Study design concepts for innovative avoidance and warning techniques.
- (U) Experimentally compare open and closed loop jamming techniques to defeat IR missile seekers.
- (U) Design and develop a future laser jammer that will have wavelengths in the 2-3 Micron, 3-5 Micron and 8-12 Micron wavelength regions. Emphasize packaging for airborne applications. Coordinated with & not duplicative of the DARPA 2 micron laser radar program.
- (U) Demonstrate a miniaturized laser warning receiver.
- (U) Conduct a flight test in conjunction with Canada of a miniaturized laser warning sensor (MINLAWS)
- (U) Define a program to validate missile infrared signature models.

Program Element: #0603270F
PE Title: Electronic Combat Technology

Budget Activity: #2 Advanced Technology Development

(U) FY 1993 Planned Program:
- (U) Study approach to a long wavelength fiber optic laser warning system. Emphasize packaging improvements.
- (U) Demonstrate laser beamrider countermeasure techniques.
- (U) Develop the next generation warning and avoidance system.
- (U) Conduct flight tests to measure the IR signature of various missiles.
- (U) Design and begin fabricating a system to detect laser beamrider missiles.

(U) Work Performed By: This project is managed by Wright Laboratory, Wright-Patterson AFB, OH. Contractors include: Westinghouse, Baltimore, MD, Loral EOS, Akron OH, Texas Instruments, Dallas, TX, and General Electric Corp, Binghampton, NY.

(U) Related Activities:
- (U) Program Element 0602702E, Tactical Technology.
- (U) Program Element 0602204F, Aerospace Avionics.
- (U) Program Element 0604270F, EW Development.
- (U) The Joint Director of Laboratories/Technical Panel for Electronic Warfare coordinates this project with the other services.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not applicable.

(U) International Cooperative Agreements: Under the Information Exchange Program (IEP-D-81-UK3) an

Laser warning is coordinated with Australia, Canada, New Zealand, and the United Kingdom through efforts of Subgroup Q under The Technical Coordination Program.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603270F
PE Title: Electronic Combat Technology
Project Number: 2432
Budget Activity: #2 Advanced Technology Development

A. (U) RESOURCES ($ In Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2432 Warning and Avoidance Receiver Systems Technology	8,969	15,042	16,673	13,373	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project develops advanced electronic combat preprocessor and processor technologies, advanced algorithm and artificial intelligence (AI) and expert software for applications on existing and future Electronic Combat systems. Improved special antenna, receiver and transmitter, and multispectral and multi-technique off-board countermeasure technologies are also developed and demonstrated in this project.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Define algorithms, that commonly occur in EW equipment as assembly language, which could be implemented in ADA as single instructions.
   - (U) Develop an advanced

2. (U) FY 1991 Planned Program:
   - (U) Demonstrate in the ALR-69 that the Random Agile Deinterleaver (RAD) algorithm reduces signal ambiguities to help identify transmitters.
   - (U) Extend application of the RAD algorithm to other systems such as ALR-56M to provide total RF signal identification.
   - (U) Demonstrate the Tactical Situation and Response Strategy (TSARS)
   - (U) Design and fabricate a breadboard

3. (U) FY 1992 Planned Program:
   - (U) Demonstrate millimeter wave decoys against
   - (U) Conceptualize design approaches that can provide covert missile time to intercept for warning receivers.

Program Element: #0603270F
PE Title: Electronic Combat Technology

Project Number: 2432
Budget Activity: #2 Advanced Technology Development

- (U) Demonstrate a. . . .

4. (U) FY 1993 Planned Program:
   - (U) Design and develop an illuminated chaff concept for countering radar tracking systems.

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

D. (U) Work Performed By: This project is managed by Wright Laboratory, Wright-Patterson AFB, OH. Contractors include: Westinghouse, Baltimore, MD; TRW, San Diego, CA; Raytheon, Goleta, CA; and Northrop, Rolling Meadows, IL and Sanders, Nashua, NH.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: Project's budget change reflects realignment of funds within the program element due to program priorities and execution.

F. (U) PROGRAM DOCUMENTATION:
- (U) TAC SON(s): 304-83, Tactical Self Protection Electronic Warfare Systems.
- (U) SAC SON(s): 12-86, B-1B Enhanced Monopulse Countermeasures.
- (U) MAC SON(s): 7-81, Defensive Systems for Airlift Aircraft.
  8-81, Defensive Systems for Combat Rescue Helicopters.

G. (U) RELATED ACTIVITIES:
- (U) Program Element 0602204F, Aerospace Avionics.
- (U) Program Element 0603203F, Avionics for Aerospace Vehicles.
- (U) The Joint Director of Laboratories/Technical Panel for Electronic Warfare coordinates this project with the other services.

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands): Not Applicable.

Program Element: #0603270F
PE Title: Electronic Combat Technology
Project Number: 2432
Budget Activity: #2 Advanced Technology Development

I. (U) International Cooperative Agreements: Through The Technical Cooperation Program (TTCP), Subgroup Q, the US cooperates in the development of EW with Australia, Canada, New Zealand, and the United Kingdom. The technology currently being pursued is application of artificial intelligence to EW to address the agile pulse/agile frequency and war reserve mode threats.

J. (U) MILESTONE SCHEDULE:

		Dates
1.	(U) Tactical Situation Assessment and Response Strategy Demonstrations-Complete	Aug 90
2.	(U) ALR-46/69 Random Agile Deinterleaver Pulse Sorting Demonstration	Sep 91
3.	(U) IR/RF Decoy Demonstration	Aug 92
4.	(U) Millimeter Wave Decoy Field Test	Mar 92
5.	(U) High Order Language Demonstration	Jan 92

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603270F
PE Title: Electronic Combat Technology
Project Number: 691X
Budget Activity: #2 Advanced Technology Development

A. (U) RESOURCES ($ In Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
691X Radio Frequency Countermeasures	9,630	9,208	10,903	12,725	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides advanced development of both techniques and hardware for both existing and new electronic warfare systems to counter threat systems (surface-to-air missile, antiaircraft artillery and air interceptors) operating in the radio frequency spectrum. The project includes the following areas: (1) supporting simulation efforts to guide investment through the evaluation of new concepts and techniques; (2) on-board jamming systems, component and techniques needed to jam enemy radar; (3) electronic collection systems to inform the field commander of changes in the electronic environment; and (4) development of advanced standoff jammer technology that will lead to greatly reduced on-board countermeasures requirements.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Successfully ground tested a
   - (U) Flight tested a High Power Countermeasures (HPCM) risk reduction system test bed to demonstrate that high power jamming can defeat threat acquisition and tracking radars.
   - (U) Fabricated advanced intrapulse processing breadboard to provide signal sorting for Radio Frequency receivers.
   - (U) Designed and fabricated an advanced threat warning antenna to receive and characterize both polarizations of RF signals.
   - (U) Designed position as part of Large Aircraft Radar EW Suite (LAREWS) program.

2. (U) FY 1991 Planned Program:
   - (U) Begin captive carry testing of non-adaptive technique to counter monopulse, semi-active radar missile threats.

Program Element: #0603270F
PE Title: Electronic Combat Technology
Project Number: 691X
Budget Activity: #2 Advanced Technology Development

- (U) Defer FY 1991 development of LAREWS to FY 1992.
- (U) Demonstrate low band advanced transmitter for potential upgrade of the EF-111.
- (U) Demonstrate HPCM test bed against operational assets.
- (U) Study design requirements for an HPCM development.

3. (U) FY 1992 Planned Program:
   - (U) Perform live-fire testing against non-adaptive techniques to counter monopulse, semi-active radar missile techniques.
   - (U) Complete demonstration of HPCM test bed against operational assets.
   - (U) Demonstrate advanced threat warning antenna program.
   - (U) Restart continued development and test of

     part of LAREWS program.

4. (U) FY 1993 Planned Program:
   - (U) Study technology requirements for dilution drones for TAC and MAC applications.
   - (U) Flight te

   - (U) Design a

     in a reliable and maintainable package.
   - (U) Continue LAREWS program.
   - (U) Develop requirements and system design of a

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

D. (U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB, OH, manages this project. Contractors include: Westinghouse, Baltimore, MD; Raytheon, Goleta, CA; and Northrop, Rolling Meadows, IL.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Due to loss of FY 91 funds for the LAREWS program, flight test of two competitor's decoys has slipped to first half of FY92.

Program Element: #0603270F
PE Title: Electronic Combat Technology
Project Number: 691X
Budget Activity: #2 Advanced Technology Development

3. (U) COST CHANGES: LAREWS program costs have increased due to program slip. Project's budget change reflects Congressional directed cuts and realignment of funds to pay for higher priority Air Force programs.

F. (U) PROGRAM DOCUMENTATION:
- (U) TAC SON(s): 304-83, Tactical Self Protection Electronic Warfare Systems.
- (U) SAC SON(s): 12-86, B-1B Enhanced Monopulse Countermeasures.
- (U) MAC SON(s): 7-81, Defensive Systems for Airlift Aircraft; 8-81, Defensive Systems for Combat Rescue Helicopters.

G. (U) RELATED ACTIVITIES:
- (U) Program Element 0602204F, Aerospace Avionics.
- (U) Program Element 0604270F, EW Development.
- (U) Program Element 0603203F, Avionics for Aerospace Vehicles.
- (U) The Joint Director of Laboratories/Technical Panel for Electronic Warfare coordinates this project with the other services.
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands): Not Applicable.

I. (U) International Cooperative Agreements: Under The Technical Coordination Program (TTCP), Subgroup Q, the US is cooperating with Australia, Canada, New Zealand and the United Kingdom to address monopulse countermeasure techniques.

J. (U) MILESTONE SCHEDULE:

	Dates
1. (U) Ground test non adaptive cross polarization techniques	Oct 90
2. (U) Flight test HPCM risk reduction	May 91 - Jan 92
3. (U) Demonstrate low band advanced transmitter	Jul 91
4. (U) Complete Testing of advanced intrapulse processing transmitter	Nov 91
5. (U) Demonstrate Advanced Threat Warning Antenna	Apr 92

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603302F Budget Activity: #2 - Advanced Technology Development
PE Title: Space and Missile Rocket Propulsion

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
6339 Air-Launched Missile Propulsion Technology	2,110	500	2,368	2,910	Cont	TBD
6340 Space Systems Propulsion Technology	6,060	7,966	9,990	9,990	Cont	TBD
6341 Ballistic Missile Propulsion Technology	2,030	1,850	2,508	3,416	Cont	TBD
Total	10,200	10,316	14,866	16,316	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program demonstrates advanced rocket propulsion technology options for air-launched missile, space, and ballistic missile systems. This critical technology enables new warfighting capabilities, enhances system survivability and operational flexibility, and ensures the reliability and cost effectiveness of space and missile systems. The most promising technologies developed in Rocket Propulsion and Astronautics Technology (PE 0602302F) are selected for risk reduction and full-scale, proof-of-principle demonstrations. This program complements technology development conducted by the other Services and NASA.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 6339, Air-Launched Missile Propulsion Technology: This project provides rocket propulsion technology options for air-to-air and air-to-surface missiles. The first task will demonstrate advanced energy management with low signature propellant and thrust vector control technology in FY 1991. This high performance, low observable motor will increase tactical missile maneuverability by 200 percent and reduce the infrared detection range by 60 percent. This project will start a second task in FY 1992 to demonstrate a low cost motor for air-to-surface standoff weapons. This task supports an interlaboratory initiative to reduce the cost of future standoff weapons by one-third compared to the AGM-130 missile system. This technology will enable low cost, precision-guided standoff weapons capable of attacking enemy targets without having the launch aircraft fly over enemy air defenses.

(U) FY 1990 Accomplishments:
- (U) Evaluated high performance/low observable motor components.
- (U) Integrated components into full-scale heavyweight motors.

(U) FY 1991 Planned Program:
- (U) Fire heavyweight motors to demonstrate motor capabilities.
- (U) Transition high performance, low observable motor technology to follow-on flight test program at Naval Weapons Center.

Program Element: #0603302F Budget Activity: #2 - Advanced Technology Development
PE Title: Space and Missile Rocket Propulsion

(U) FY 1992 Planned Program:
- (U) Complete design and analysis of low cost rocket motor for air-to-surface standoff missiles.
- (U) Fabricate key low cost standoff motor components for bench-scale testing to evaluate component designs.

(U) FY 1993 Planned Program:
- (U) Evaluate low cost motor components and integrate components into heavyweight motor design for full-scale testing.
- (U) Conduct preliminary design review of low cost rocket motor.

(U) Work Performed By: This project is managed by the Propulsion Directorate of the Phillips Laboratory, Edwards AFB CA. The only contractor is Hercules/ABL, Rocket Center WV.

(U) Related Activities:
(U) PE 0602302F, Rocket Propulsion and Astronautics Technology.
(U) PE 0603601F, Conventional Weapons.
(U) PE 0603792N, Multi-Mission Propulsion Technology.
(U) MOA between Naval Weapons Center and Phillips Laboratory for tactical pulsed rocket motor/thrust vector control technology.
(U) Coordination is accomplished through the Joint Army-Navy-NASA-Air Force Interagency Propulsion Committee and the Joint Tactical Air-to-Air Missile Office.
(U) There is no unnecessary duplication of effort within the Air Force, NASA, or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 6340, Space Systems Propulsion Technology: This project provides rocket propulsion technology options for satellites and orbit transfer vehicles. The first task will demonstrate an experimental liquid engine, designated XLR-132, in FY 1991. The XLR-132 engine will increase satellite maneuverability by 40 percent. The second task will flight-qualify an arcjet (electric) propulsion system on the ground in FY 1993. The arcjet propulsion system will be demonstrated in space in FY 1995. This technology will enable electric orbit transfer vehicles (EOTVs) which reduce space launch costs and increase operational flexibility. An arcjet-propelled EOTV will let the operator replace a Titan IV with a smaller, cheaper Atlas II launch vehicle, saving as much as $100 million per launch. This project will start a third task in FY 1992 to demonstrate advanced cryogenic engine technology. This technology will enable reliable upper stages that deliver payloads to orbit at a lower cost than the current Centaur upper stage.

(U) FY 1990 Accomplishments:
- (U) Conducted critical design review of XLR-132 space engine.
- (U) Integrated flightweight components and assembled full-scale

XLR-132 engine for final series of ground testing.
- (U) Completed design and analysis of arcjet propulsion system.

(U) FY 1991 Planned Program:
- (U) Demonstrate XLR-132 engine under conditions which simulate orbital transfer from low earth to high earth orbit.
- (U) Fabricate arcjet propulsion system components for design tests.
- (U) Evaluate design of arcjet propulsion system components in series of bench-scale tests and update component designs.
- (U) Conduct preliminary design review of full-scale arcjet propulsion system.

(U) FY 1992 Planned Program:
- (U) Transition XLR-132 space engine to Space Systems Division program offices as outlined in technology transition plan.
- (U) Integrate proven components and fabricate full-scale arcjet propulsion system for design verification testing.
- (U) Fire arcjet propulsion system to verify design performance.
- (U) Conduct critical design review of arcjet propulsion system.
- (U) Complete design and analysis of advanced cryogenic engine.

(U) FY 1993 Planned Program:
- (U) Conduct final series of ground tests in vacuum chamber to flight-qualify arcjet propulsion system for spaceflight.
- (U) Transition arcjet propulsion system to Space Systems Division program offices as outlined in technology transition plan.
- (U) Fabricate cryogenic engine components for bench-scale testing.

(U) Work Performed By: The project is managed by the Propulsion Directorate of the Phillips Laboratory, Edwards AFB CA. The three contractors are GenCorp/Aerojet Propulsion, Sacramento CA; Rockwell/Rocketdyne, Canoga Park CA; and TRW, Redondo Beach CA.

(U) Related Activities:
- (U) PE 0602302F, Rocket Propulsion and Astronautics Technology.
- (U) PE 0603401F, Advanced Spacecraft Technology.
- (U) PE 0603402F, Space Test Program (STP).
- (U) PE 0303110F, Defense Satellite Communications System (DSCS).
- (U) PE 0305165F, NAVSTAR Global Positioning System (GPS).
- (U) PE 0305171F, Space Shuttle Operations (Upper Stages).
- (U) MOA between STP office and Phillips Laboratory for integration, launch, and flight of electric propulsion space experiment.
- (U) Coordination is accomplished through the Joint Army-Navy-NASA-Air Force Interagency Propulsion Committee and the Air Force/NASA Space Technology Interdependency Group.
- (U) There is no unnecessary duplication of effort within the Air Force, NASA, or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0603302F Budget Activity: #2 - Advanced Technology Development
PE Title: Space and Missile Rocket Propulsion

3. (U) Project 6341, Ballistic Missile Propulsion Technology: This project demonstrates rocket propulsion technology options for intercontinental ballistic missile (ICBM) systems. The first task will demonstrate a revolutionary booster configuration in FY 1991. This integrated stage technology eliminates the missile interstage area by nesting the forward dome of the first stage motor into the nozzle of the second stage motor. This simplified configuration increases missile range by 20 percent and reduces booster fabrication costs by 30 percent. This project will start a second task in FY 1992 to demonstrate advanced ICBM booster technologies. The booster technologies will enhance survivability, increase warfighting capability, and improve the cost effectiveness of ICBMs in a post-START (Strategic Arms Reduction Talks) environment.

(U) FY 1990 Accomplishments:
- (U) Conducted evaluation tests on integrated stage components.
- (U) Verified propellant properties in small-scale firings.

(U) FY 1991 Planned Program:
- (U) Update integrated stage design based on bench-scale testing.
- (U) Fabricate intermediate-size test motors for final series of ground test firings to verify integrated stage performance.

(U) FY 1992 Planned Program:
- (U) Conduct ground test firings under simulated altitude to demonstrate capability of integrated stage technology.
- (U) Complete design and analysis of advanced ICBM booster.
- (U) Fabricate advanced ICBM booster components for bench-scale testing to evaluate component design.

(U) FY 1993 Planned Program:
- (U) Evaluate design integrity of booster components in series of bench-scale tests.
- (U) Update advanced ICBM booster design using test results.
- (U) Conduct preliminary design review of advanced ICBM booster.

(U) Work Performed By: This project is managed by the Propulsion Directorate of the Phillips Laboratory, Edwards AFB CA. The only contractor is GenCorp/Aerojet Propulsion, Sacramento CA.

(U) Related Activities:
- (U) PE 0602302F, Rocket Propulsion and Astronautics Technology.
- (U) PE 0603311F, Ballistic Missile Technology.
- (U) Coordination is accomplished through the Joint Army-Navy-NASA-Air Force Interagency Propulsion Committee.
- (U) There is no unnecessary duplication of effort within the Air Force, NASA, or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL BUDGET RDT&E SUMMARY SHEET

Program Element: #0603307F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability Advanced Development

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3018 Air Base Operability	2,757	3,399	3,375	3,858	Cont	TBD
Total	2,757	3,399	3,375	3,858	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Air Base Operability (ABO) integrates operational concepts with research, development, and acquisition programs to improve a sustained sortie generation capability should an attack occur on or close to an air base. The Air Force must provide enough people, aircraft, facilities and key supporting systems so that theater air bases can continue to operate following enemy attacks allowing air power to be continuously and effectively employed throughout the conflict.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 3018, Air Base Operability (ABO): Provides Advanced Development efforts for active and passive defense, air base survivability, base recovery, and sortie generation.

(U) FY 1990 Accomplishments:

- (U) Combat Base Assessment Model: Continued analysis for the effectiveness modeling of multiple air bases.
- (U) Communication Cable Survivability: Continued efforts to improve ABO communications and base communications survivability, through system and equipment tests.
- (U) Utility Design Manuals: Focused efforts on improving utility survivability and recovery techniques. Completed 2 utility design/criteria manuals.
- (U) Chem/Bio Cell Study: Completed chemical/biological cell study.
- (U) Laser Neutralization Program: Continued design analysis on using mobile laser to neutralize ordnance in a Base Recovery After Attack (BRAAT) environment.
- (U) Fiber Optic Test: Completed Fiber Optic Cable blast test.
- (U) Creek Shadow: Provided support for Creek Shadow Camouflage, Concealment, and Deception demonstration.

Program Element: #0603307F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability Advanced Development

- (U) Vertical Chaff Demo: Investigated a fixed vertical chaff dispensing system to aid in air base passive defense.
- (U) Aircraft Decoys: Tested effectiveness of lightweight/low cost aircraft decoys in conjunction with Army smoke obscurant tests.
- (U) Dispersed Integrated Security System: Develop an integrated tactical security system for air base ground defense and dispersed mission.
- (U) Defensive Position Study: Completed development and testing of defensive fighting position.
- (U) Aircraft Shelter Upgrade/Retrofit Program: Initiated development of aircraft shelter upgrade to improve aircraft survivability.
- (U) Survivability of Structures: Initiated analysis and testing to improve critical facility survivability to non-nuclear weapon effects.
- (U) Electrical Generation/Distribution System: Provided a survivable theater electrical generation/distribution system.

(U) FY 1991 Planned Program:

- (U) Aircraft Shelter Upgrade/Retrofit Program: Continue effort to produce specifications, design drawings and guidance.
- (U) Communication Cable Survivability: Complete tests to evaluate and refine promising protective installation methods to improve base communication cable survivability.
- (U) Survivability of Structures: Continue analysis and testing on survivability of structures founded on piles in saturated soils.
- (U) Dispersed Integrated Security Systems: Continue methods to integrate DISS.
- (U) Camouflage, Concealment, and Deception (CCD) Equipment Demo: Microturbo cloud characterization, infra-red stains & nets, air inflatable decoys.
- (U) Smoke Methodology Handbook: Develop the smoke employment methodology handbook. Single year effort.
- (U) Unexploded Ordnance (UXO) Locator system: Conduct buried UXOs study.
- (U) Minefield Clearance Study: Conduct a minefield clearance technology study.
- (U) Damage Assessment Study: Conduct a damage assessment technology study.
- (U) Combat Base Assessment Model: Complete an evaluation on CBAM pad effectiveness. Continue modeling applications.
- (U) Laser Neutralization Program: Continue mobile system development to include actual laser tests on munitions.
- (U) Conduct Threat Analysis Study.

(U) FY 1992 Planned Program:

- (U) Aircraft Shelter Upgrade/Retrofit Program: Continue analysis and produce specs design drawings and guidance.
- (U) Laser Neutralization Program: Concept demonstration and validation for laser neutralization of munitions program.

Program Element: #0603307F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability Advanced Development

- (U) Survivability of Structures: Conduct full scale testing to validate upgrades for survivability of structures in saturated soils.
- (U) Dispersed Integrated Security Systems: Program demo.
- (U) CCD Equipment Demo: Advanced IR nets and smokes, applique camouflage.
- (U) UXO Locator system: Complete study for locating buried UXO.
- (U) Minefield Clearance Study: Complete study for improving clearance capabilities.
- (U) Damage Assessment Study: Complete study for improving assessment capabilities.

(U) FY 1993 Planned Program:
- (U) Aircraft Shelter Upgrade/Retrofit Program: Continue effort to produce specifications design drawings and guidance.
- (U) Utility Analysis: Provide a marginal utility analysis to PACAF.
- (U) Aircraft Attrition Data Base: Develop a red aircraft attrition database.
- (U) Fire Fighting Vulnerabilities: Assess fire fighting vulnerabilities in relation to sortie generation.
- (U) Hardline Cable Distribution System: Assess hardline cable distribution system survivability.
- (U) Laser Neutralization Program: Continue laser neutralization of munitions program for Full Scale Development.
- (U) CCD equipment Demo: Continue efforts to improve radar & nets, stains and multispectral smoke additives.
- (U) Survivability of Structures: Continue full scale testing to validate upgrades for survivability of structures in saturated soils.

(U) Work Performed By: Sparta Inc., Huntsville AL; Diversified Engineering Inc., Richmond VA. In-house development organizations are: Aeronautical Systems Division and Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB OH; Air Force Engineering and Services Center, Tyndall AFB FL; Electronic Systems Division, Hanscom AFB MA; Air Force Weapons Laboratory and Phillips Laboratory, Kirtland AFB NM; Sverdrup Technology, Eglin AFB FL.

(U) Related Activities:
- (U) Program Element #0604617F, Air Base Operability.
- (U) Program Element #0604601F, Chemical/Biological Defense Equipment.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperation Agreements: Not Applicable.

FY 1992 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603311F Budget Activity: #2 - Advanced Technology Development
Title: Ballistic Missile Technology

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
4091 Missile Avionics	53,794	44,600	48,143	53,263	Cont	TBD
4092 Reentry Vehicle Penetration Technology	5,904	10,200	5,416	6,421	Cont	TBD
4093 Propulsion and Booster Technology	0	0	1,838	4,637	Cont	TBD
4094 Survivability/Endurability Technology	1,000	0	296	595	Cont	TBD
4095 Technology Integration and Demonstration	5,000	10,310	7,352	4,592	Cont	TBD
TOTAL	65,698	65,110	63,045	69,508	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Through FY 1991, ICBM technology development work was performed in the Advanced Strategic Missile Systems (ASMS) 6.3B program element. ASMS work was organized into technical application areas covering the phases of the ICBM mission--Survive/Endure Launch, Boost/Guidance, Reentry Phenomenology, Defense Penetration, and Target Kill. Beginning in FY 1992, ICBM technology development work is restructured. The former ASMS 6.3B advanced development program element 63311F has been redirected into a 6.3A advanced technology development program. Ballistic Missile Technology (BMT) is a new Air Force Science and Technology program providing technology for future ICBM systems and subsystems. BMT develops and demonstrates fully integrated, synergistic technologies for new strategic missile systems under simulated operational conditions. Emphasis is on technologies which provide low cost, low-maintenance, increased reliability, and increased performance and survivability for current and future missile systems. Demonstration of integrated technologies is essential to verify real world benefits/payoffs of the integrated system and to reduce technology transition risk. Through BMT, the Air Force coordinates ICBM research and development efforts in various laboratories, performs technology tradeoffs, develops new hardware, and conducts ground and flight testing (Advanced Technology Transition Demonstration). A vigorous BMT program maintains US "R&D Deterrent", improving ICBM force flexibility for US security options within a changing global environment.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 4092, Reentry Vehicle Penetration Technology (RVPT): This project incorporates technology development required for

Program Element: #0603311F Budget Activity: #2 - Advanced Technology Development
Title: Ballistic Missile Technology

penetration of an RV through enemy defenses, weapons delivery, and reentry phenomenology. Defense Penetration technology provides penetration aid options for defeating current radar and projected optical ABM threats. The Weapons delivery technology will address development of technologies to put at risk certain targets currently inaccessible to ICBMs. Reentry phenomenology technology addresses new reentry vehicle materials, aerodynamics characterization, and sensor integration technology for reentry vehicles and decoys. RVPT technology supports the Prompt Strategic Strike Capability (PSSC) for 2010 in response to draft SAC Mission Needs Statement (MNS) 01-90.

(U) FY 1990 Accomplishments:
- (U) Validated codes and tested RV antenna window system design
- (U) Manufactured and tested low thermal conductivity PAN fibers for RV heat shields.
- (U) Completed the Phase 0 HP-MaRV study program which was initiated in FY 1989 to assess technology requirements and preliminary design and effectiveness.
- (U) Conducted design review and fabrication of 1st Pyro carrier vehicle (decoy sized).
- (U) Conducted test planning and analytical demonstration of a pyro masking concept (Project Radiant Shield) for PBV (Post Boost Vehicle) operations.

(U) FY 1991 Planned Program:
- (U) Initiate HP-MaRV Phase 1 program. The Phase 1 output will be HP-MaRV flight test vehicle configurations and feasibility demonstration program plan.
- (U) Ground tests to be conducted at the Arnold Engineering Development Center (AEDC) Tunnel B facility in support of Computational Fluid Dynamics (CFD) code validation.
- (U) Complete upgrade of computational codes.
- (U) Continue on-going ground test and analytical code development; predicting/validating flow field plasma/ electromagnetic interaction.
- (U) Complete development/testing of small payload ejector assembly.
- (U) Fabricate 2nd Pyro carrier vehicle (decoy sized).

(U) FY 1992 Planned Program:
- (U) Complete in-house risk reduction technology development design trades for PSSC for 2010.
- (U) Complete the HP-MaRV Phase 1 program initiated in FY 1991 to provide technology options for vehicle configurations.
- (U) Evaluate and analyze the data from the HP-MaRV Phase 1 study and ground tests in order to establish future code development objectives and test plans for the Wright Laboratory.
- (U) Fabricate 3rd Pyro carrier vehicle and 2nd Pyro full-scale vehicle (modified MK12).
- (U) Initiate BMT materials testing program.

(U) FY 1993 Planned Program:
- (U) Initiate technology trades, technology risk reduction

Program Element: #0603311F Budget Activity: #2 - Advanced Technology Development
Title: Ballistic Missile Technology

development and definition of a non-nuclear reentry weapon.
- (U) Formulate non-nuclear kill technology road map and testing requirements.
- (U) Fly 2nd Pyro carrier vehicle (1Q) and analyze data.
- (U) Define optical signature data base for increased pen aid technology performance and payload development dynamics control.

(U) Work Performed By: Phillips Laboratory, Kirtland AFB, NM is the responsible technical activity. Major contractors include: Acurex Corp, Mountain View, CA; ATSS, San Bernardino, CA; FMI, Biddeford ME; Fiberite, Winona, MN; Ford Aerospace, Costa Mesa, CA; General Electric, Reentry Systems Division, Philadelphia, PA (MaRV technology); Hercules, Salt Lake City, UT; Hypersonics, Sunnyvale, CA; Lockheed Missiles and Space Company, Sunnyvale, CA; McDonnell Douglas Space Systems Company, Huntington Beach, CA; PDA, Costa Mesa, CA; Southern Research Institute, Birmingham, AL; Textron Defense Systems, Boston, MA; and TRW/Ballistic Missiles Division, San Bernardino, CA (Systems Engineering/Technical Assistance). The BMT program makes extensive use of government laboratories.

(U) Related Activities:
(U) PE 0602102F, Materials.
(U) PE 0602201F, Aero Flight Dynamics.
(U) Coordinated DARPA activity to evaluate emerging miniature guidance systems development for non-nuclear kill (NNK) applications.
(U) Extensive coordination with MIT Lincoln Laboratory (on-board radiometer on Pyro flight tests).
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 4093, Propulsion & Booster Technology: This project integrates missile and propulsion technologies for future ICBMs to optimize system performance. It will demonstrate rocket propulsion technologies to extend performance, enhance producibility, increase reliability, and lower cost of advanced ICBMs. In the near future, it will demonstrate several emerging technologies that are critical for; (a) two stage ICBMs, (b) integrated stage concept, (c) fast burn ICBMs, (d) advanced materials and processes, (e) low cost/high performance booster nozzles and thrust vector controls, and (f) "environmentally safe" and high performance solid propellants. The project will subsequently demonstrate propulsion technologies for (a) post boost vehicles and (b) reentry vehicles, and (c) propellants derived from high energy density matter (HEDM). In this project rocket propulsion will be integrated with other missile technologies.

(U) FY 1990 Accomplishments:

Program Element: #0603311F Budget Activity: #2 - Advanced Technology Development
Title: Ballistic Missile Technology

(U) None.

(U) FY 1991 Planned Program:
(U) None.

(U) FY 1992 Planned Program:
- (U) Conduct technology application trades, risk assessments, and initiate definition of two-stage ICBM designs emphasizing affordability and innovative propulsion.
- (U) Demonstrate environmentally safe propellants with suitable mechanical and ballistic properties in large scale mixes.

(U) FY 1993 Planned Program:
- (U) Initiate technology subsystem applications and demonstrations for two stage ICBM designs, and optimize integration of missile components.
- (U) Integrate and demonstrate advanced polymer composite cases, forced deflection nozzles, and other advanced motor technologies.
- (U) Continue demonstration of environmentally safe propellants. Study the impact of various formulations on processing, costs, properties and environment.

(U) Worked Performed By: The responsible agency is the Phillips Laboratory, Kirtland AFB, NM. Major contractors include: Thiokol Corporation, Brigham City, UT; Hercules, INC, Magna, UT; Aerojet Propulsion Company, Sacramento, CA; Chemical System Division, San Jose, CA; Atlantic Research Corporation, Gainsville, VA; Rockwell/Rocketdyne Division, Canoga Park, CA.

(U) Related Activities:
(U) PE 63302F, Space & Missile Rocket Propulsion.
(U) PE 62302F, Rocket Propulsion & Astronautics Technology.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 4094, Survivability/Endurability Technology: This project technology improves the reliability, endurability and maintainability of present and future ICBM systems/subsystems. S/E technology is used to support risk reduction technology development for the Prompt Strategic Strike Capability (PSSC) for 2010 in response to draft SAC Mission Needs Statement (MNS) 01-90. The S/E technologies will support PSSC cost and effectiveness evaluations while conducting small scale feasibility and validation tests. Specific technical areas for this project include basing technology to increase hardness and endurance through development of low-power semi-dormant electronics and advanced batteries. This project will address Survivable Communications needs and technologies for both future mobile and silo based ICBMs.

(U) FY 1990 Accomplishments:

Program Element: #0603311F Budget Activity: #2 - Advanced Technology Development
Title: Ballistic Missile Technology

- (U) Explored implant/tag countermeasure devices.
- (U) Developed physical security signal processing techniques and collected sensor signatures.
- (U) Completed Minute Man III cannisterization and hardened silo study.
- (U) Identified a silo launcher that shows potential for very high hardness, fast deployment, and possibility for upgrading to mobile or Multiple Protective Shelter (MPS) basing.
- (U) Identified a new near surface soft tunnel/hard Transporter Erector Launcher (TEL) basing concept with potential for very high survivability.

(U) FY 1991 Planned Program:
- (U) No funding in FY 1991.

(U) FY 1992 Planned Program:
- (U) Analyze ICBM communications requirements and threats.
- (U) Define link, node, and network candidates for survivable communications architectures.
- (U) Initiate technology effort for encapsulated silo-multi-mode basing and operations.

(U) FY 1993 Planned Program:
- (U) Perform analytic feasibility demonstration of ICBM communication architectures.
- (U) Develop survivable antenna technologies.
- (U) Determine communication systems hardware/software sizing
- (U) Define computer-aided/design tools for survivable basing to include encapsulated/multi-mode basing.
- (U) Define critical S/E technology issues.

(U) Work Performed By: The responsible agency as the Phillips Laboratory. Basing contractors include SAIC, LaJolla, CA and Boeing, Redmond, WA. C3 contractors include GTE, Westboro MA; Loral, Philadelphia, PA.

(U) Related Activities:
(U) PE 0602702, Command Control and Communications.
(U) PE 0602203, Aerospace Propulsion.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 4095, Technology Integration & Demonstration: This project integrates and flight validates technologies developed in the BMT program and will provide proven technology options for future ICBM systems. This project will evaluate fast burn integrated stage booster technology, improved dormant guidance technology, and advanced materials for Prompt Strategic Strike Capability (PSSC) for 2010 as identified in draft SAC MNS 01-90.

(U) FY 1990 Accomplishments:

Program Element: #0603311F Budget Activity: #2 - Advanced Technology Development
Title: Ballistic Missile Technology

- (U) Conducted flight (Maneuvering Systems Technology, MaST) and underground nuclear test of possible nose tip, heat shield, and antenna window materials.
- (U) Completed Zero-G flight tests of candidate thin film materials on the Gossamer program.

(U) FY 1991 Planned Program:
- (U) Reduce MaST flight test plasma data consisting of C-Band up link and mutual coupling.
- (U) Plan and conduct flight test to gather high altitude density data and test motor for Pyrotechnic (PYRO) program optical masker.
- (U) Fly pyrotechnic motor on TDF vehicle (modified MK12).

(U) FY 1992 Planned Program:
- (U) Complete reduction and analysis of pyrotechnic signature data from FY 1991 TDF.
- (U) Complete reduction and analysis of high altitude density experiment data from FY 1991 test.
- (U) Conduct flight test of 1st Pyrotechnic penetration aid carrier vehicle (Possible Radiant Shield piggyback).
- (U) Initiate design of BMT flight test payloads and vehicle.
- (U) Initiate test and evaluation of BMT Micro Systems payload/vehicle components.

(U) FY 1993 Planned Program:
- (U) Continue payload and vehicle development and fabrication.
- (U) Continue test and evaluation of BMT payload/vehicle components.

(U) Work Performed By: The responsible agency is the Phillips Laboratory. Contractors include McDonnell Douglas SSC, Huntington Beach, CA; Rockwell International/Autonetics SSD, Anaheim, CA; and Boeing, Redmond, WA.

(U) Related Activities:
(U) PE 0602204F, Avionics.
(U) PE 0602302F, Rocket Propulsion.
(U) PE 0602102F, Materials.
(U) PE 0601102F, Defense Research Sciences.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603311F Project Number: 4091
PE Title: Ballistic Missile Technology Budget Activity: #2 - Advanced Technology Development

A. (U) RESOURCES ($ in Thousands):

Project Title / Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Missile Avionics	54,000	44,600	48,998	53,262	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
Ballistic Missile Technology (BMT) is the Air Force Science and Technology program supporting future ICBM systems and subsystems. This program develops and demonstrates fully integrated, synergistic technologies for new strategic missiles under simulated operational conditions. Demonstrations of integrated technologies is essential to verify real world benefits/payoffs of the integrated system and to reduce technology transition risk. Emphasis is on technologies which provide low cost, low-maintenance, increased reliability, and increased performance and survivability for current and future missile systems. Guidance and control subsystems are the major life cycle cost items for ICBMs. The current goal of the Missile Avionics project is to develop technologies to support advanced guidance that maintains present day accuracies while dramatically reducing acquisition and support costs for existing and future ICBMs. The BMT guidance technology projects focus on two efforts. The Advanced Inertial Measurement System (AIMS) is an advanced technology transition demonstration (ATTD) program. The AIMS technology development will provide demonstrated low cost guidance components based on the new generation of solid state instruments. The second focus is the Advanced Inertial Measurement Unit (AIMU) for use in maneuvering reentry vehicles.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Delivered Engineering Test Unit (ETU) Advanced Inertial Measurement Unit (AIMU) for initial characterization.
   - (U) Completed radiation test planning for AIMU ring laser gyros (RLG).
   - (U) Defined four candidate advanced guidance concepts.
   - (U) Began resolution of case heading sensitivity of autonomous RLG.

2. (U) FY 1991 Planned Program:
   - (U) AIMU Flight Qual Test of Flight Qual Unit, deliver four Flight Test Units and continue ground test program.
   - (U) Initiate (AIMS) advanced development for low cost guidance with solid state instruments.
   - (U) Evaluate integrated guidance options.
   - (U) Design test Reentry Vehicle (RV) for Micro Systems.
   - (U) Begin radiation testing of AIMU Ring Laser Gyros.
   - (U) Conduct evaluation of four candidate guidance architectures.

3. (U) FY 1992 Planned Program:
   - (U) Complete ground and dormancy testing of AIMU.
   - (U) Continue AIMS advanced development for low cost guidance with solid state instruments.

Program Element: #0603311F
PE Title: Ballistic Missile Technology
Project Number: 4091
Budget Activity: #2 - Advanced Technology Development

- (U) Build test reentry vehicle and prepare for flight test to be conducted under Missile Systems Demonstration, Proj 4095.
- (U) Complete Integrated Guidance Study.

4. (U) FY 1993 Planned Program:
   - (U) Complete fabricatior and performance testing of AIMS engineering test units (ETUs) and begin fabrication of prototype units.
   - (U) Continued flight test preparation for Micro Systems.

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

D. (U) Work Performed By: The responsible agency is the Phillips Laboratory, Kirtland Air Force Base, NM. Major contractors include: C.S. Draper Laboratory, Cambridge, MA (guidance systems development); Honeywell, Inc., Clearwater, FL (AIMU); Rockwell International, Autonetics Division, Anaheim, CA (AIMU); Competitive source selection for AIMS ATTD. Potential contractors are RI/Autonetics, General Electric (Pittsfield, PA) and Honeywell, Northrop ESD, Hawthorne, CA, and Litton Industries, MA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Program has been restructured from a 6.3B program to a 6.3A program to be managed by Phillips Laboratory, Kirtland AFB, NM.
2. (U) SCHEDULE CHANGES: Not Applicable.
3. (U) COST CHANGES: Not Applicable.

F. (U) PROGRAM DOCUMENTATION:
(U) AFLC SON 001-90, Improved Reliability/Maintainability Advanced Guidance System for ICBMs
(U) Draft SAC Mission Needs Statement (MNS) 01-90, Prompt Strategic Strike Capability for 2010.

G. (U) RELATED ACTIVITIES:
(U) PE 0602204F, Avionics.
(U) PE 0602302F, Rocket Propulsion.
(U) PE 0602102F, Materials.
(U) PE 0601102F, Defense Research Sciences.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1.	(U) AIMS contract award	3rd Quarter, FY 1991
2.	(U) AIMU Engineering Test Unit Delivery	1st Quarter, FY 1991
3.	(U) AIMU Complete Dormancy Test	3rd Quarter, FY 1992
4.	(U) Complete AIMS ETU Test	2nd Quarter, Fy 1993

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603363F Budget Activity: #2 - Advanced Technology Development
Title: Armament Technology Integration

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2718 Air-to-Surface Armament Technology Integration	380	609	800	1,100	0	38,794
3254 Advanced Air-to-Air Missile Technology Integration	421	610	1,331	1,283	0	3,645
Total	801	1,219	2,131	2,383	0	42,437

B. (U) BRIEF DESCRIPTION OF ELEMENT: This advanced development program integrates and demonstrates of various air-to-surface and air-to-air conventional weapons technologies.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2718: Air-to-Surface Armament Technology Integration: The Air-to-Surface Armament Technology Integration (ASATI) project examines advanced air-to-surface armament technologies and flight hardware for integration/demonstration and potential incorporation into advanced weapon systems and preplanned product improvements of current systems. Candidate subsystems include: HAVE SLICK weapon airframe, Autonomous Synthetic Aperture Radar Guidance, Hard Target Ordnance Technology, Smart Submunition, Advanced Technology Laser Radar System, Dual Mode Seeker, and other advanced guidance, navigation and control technologies. Payoffs include enhanced lethality of air-to-surface weapons against advanced targets, enhanced operational flexibility, increased reliability and affordability and reduced cost and risk.

(U) FY 1990 Accomplishments:
- (U) Completed trade-off study between technology maturity, cost and performance and prioritized ASATI subsystem technologies.

(U) FY 1991 Planned Program:
- (U) Conduct simulations and select ASATI subsystems for technology integration.

(U) FY 1992 Planned Program:
- (U) Begin aircraft integration of selected air-to-surface weapon subsystems.
- (U) Determine interface requirements and form, fit and function issues for candidate subsystems needed for a hard target weapon with rocket propulsion and standoff dispensers.

Program Element: #0603363F Budget Activity: #2 - Advanced Technology Development
PE Title: Armament Technology Integration

(U) FY 1993 Planned Program:
- (U) Conduct airframe/propulsion integration for standoff air-to-surface weapons.
- (U) Evaluate incorporation of air-breathing propulsion using expendable turbojet technology into a hard target standoff weapon.

(U) Work Performed by: The ASATI project is managed by the Wright Laboratory's Armament Directorate, Eglin AFB FL. Test facilities at the Air Force Development Test Center, Eglin AFB FL and at the Air Force Flight Test Center, Edwards AFB CA support this program.

(U) Related Activities:
(U) PE 0602602F, Conventional Munitions.
(U) PE 0603245F, Advanced Flight Technology Integration
(U) PE 0603601F, Conventional Weapons Technology.
(U) PE 0603313A, Missile/Rocket Components.
(U) PE 0603792N, Advanced Technology Demonstrations.
(U) PE 0603611M, Mobile Protected Gun System.
(U) There is no duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3254: Air-to-Air Missile Technology Integration (AAMTI). This project integrates and demonstrates advanced air-to-air missile technologies to establish their performance and operational value for incorporation into advanced missile systems and pre-planned product improvements of current systems. The payoffs from this project include: improved performance, enhanced operational flexibility, increased reliability and affordability, and reduced cost and risk.

(U) FY 1990 Accomplishments:
- (U) Reviewed candidate air-to-air subsystem technologies, incorporating tri-service inputs.
- (U) Initiated trade-offs between air-to-air technology maturity, cost and performance and prioritize subsystem technologies.

(U) FY 1991 Planned Program:
- (U) Select air-to-air subsystem technologies based upon simulations and tri-service coordination for integration demonstration.

Program Element: #0603363F Budget Activity: #2 - Advanced Technology Development
PE Title: Armament Technology Integration

(U) FY 1992 Planned Program:
- (U) Select air-to-air weapon subsystems with applicability for FY 1996-1999 Pre-Planned Product Improvements (P3I) to the Advanced Medium Range Air-to-Air Missile (AMRAAM). Technologies to be examined include advanced processors, power supplies, guidance laws and Ada flight software.
- (U) Define requirements for integrating an air-breathing Variable Flow Ducted Rocket (VFDR) propulsion system with an advanced high performance/low cost composite material airframe to reduce development risk for AMRAAM P3I.

(U) FY 1993 Planned Program:
- (U) Finalize plans for AMRAAM P3I candidate technologies.
- (U) Complete VFDR missile predesign and perform detailed design.

(U) Work Performed by: This in-house program is managed by the Wright Laboratory's Armament Directorate, Eglin AFB FL. Test facilities at the Air Force Development Test Center, Eglin AFB FL, the Air Force Flight Test Center, Edwards AFB CA and at the White Sands Missile Range NM support this program.

(U) Related Activities:
- (U) PE 0602602F, Conventional Munitions.
- (U) PE 0603601F, Conventional Weapons Technology.
- (U) PE 0604314F, Advanced Medium Range Air-to-Air Missile.
- (U) PE 0603216F, Aerospace Propulsion and Power Technology.
- (U) The USA/USN/USAF Memorandum of Understanding on Advanced Missile Technology Integration, dated 23 Feb 87, applies.
- (U) The USN/USAF Memorandum of Agreement on Tactical Air-to-Air Missiles, dated 26 May 88, applies.
- (U) There is no duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603401F Budget Activity: #2 - Adv Technology Development
PE Title: Advanced Spacecraft Technology

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2181 Advanced Space Computer Technology	8,823	8,500	12,600	13,500	Cont	TBD
2198 Advanced Space Technology Assessments	978	200	0	0	0	TBD
3784 Advanced Space Communications Technology	1,159	1,301	2,064	2,855	Cont	TBD
3834 Advanced Spacecraft Technology Integration	0	250	400	450	Cont	TBD
3977 Thermionic Space Power	8,262	300	300	300	Cont	TBD
682J Advanced Space Power Technology	1,557	2,000	2,550	4,050	Cont	TBD
Total	20,779	12,551	17,914	21,155	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This generic satellite Science and Technology (S&T) program is the Air Force's primary source of advanced satellite subsystems. Efforts are focused on three high-leverage technologies: radiation hardened microelectronics; assured, secure space communications; and compact, survivable space power generation and storage. The spacecraft technology integration effort demonstrates innovative space technologies and operational concepts. The space computer technology project will supply the baseline systems for at least six satellite programs. A satellite survivability demonstration will prove prototype space computers and other state-of-the-art survivability and autonomy technologies in cooperation with the Defense Advanced Research Project Agency's (DARPA) Advanced Space Technology Program. A proposed advanced spacecraft technology integration project will, with additional funding currently being identified, demonstrate the flight, navigation and survival of an electric arcjet propelled orbit transfer vehicle in a payload transfer from low-earth orbit to geosynchronous orbit. These two demonstrations will decrease the time required to transition innovative spacecraft technologies to operational use and lessen the development risk and cost to incorporate in new systems.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project: 2198, Advanced Space Technology Assessments: This project helps develop the Space Systems and Ballistic Systems S&T Investment Strategy. This is a planning activity which documents technology requirements for future Air Force systems, relates them to government technology development programs, and addresses the abilities of these programs to meet the system requirements. Analysis identifies potential technology breakthroughs and any

weaknesses in our technology base. Independent organizations, both within government and industry, use their own resources to critique results, thereby validating and optimizing the product.

(U) FY 1990 Accomplishments:
- (U) Developed the first Functional TAP for Space and Missiles which became a master plan for space technology investment.
- (U) Performed technology trade studies for space surveillance.

(U) FY 1991 Planned Program:
- (U) Update and improve the Space and Missiles Functional TAP.
- (U) Perform satellite autonomy and space environment assessments.

(U) FY 1992 Planned Program:
- (U) No effort planned in this project.

(U) FY 1993 Planned Program:
- (U) No effort planned in this project.

(U) Work Performed By: Managed by Phillips Lab, Kirtland AFB NM. Contractor is Aerospace Corporation, El Segundo CA.

(U) Related Activities:
(U) There is no unnecessary duplication within the USAF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project: 3784, Advanced Space Communication Technology: This project develops highly integrated Super High Frequency (SHF) and Extremely High Frequency (EHF) components. Efforts support the Defense Satellite Communications System follow-on and other survivable wideband satellite upgrades and will result in improved performance and reduce the communications payload size, weight and power requirements by a factor of at least three. High dynamic range spacecraft uplink receivers will be developed to mitigate the effects of large jammers. New lightwight antenna beam-forming networks that provide a factor of five weight savings will be investigated. Efforts seek to increase the downlink power output that would be able to support an increased number of terminals. Work is coordinated under the Assistant Secretary of Defense for C3I, and develops enabling technology for the Air Force Space Command (AFSPACECOM) and Defense Communications Agency (DCA) Military Satellite Communications Architectures and the Assured Mission Support Space Architecture.

(U) FY 1990 Accomplishments:
- (U) Completed user community definition for 44 GHz receiver.
- (U) Completed 60 GHz crosslink transmitter diode development.
- (U) Completed 20 GHz downlink transmitter diode reliability tests.

Program Element: #0603401F Budget Activity: #2 - Adv Technology Development
PE Title: Advanced Spacecraft Technology

(U) FY 1991 Planned Program:
- (U) Fabricate and test 44 GHz and 60 GHz advanced space receiver components which will demonstrate 2-3 times better performance than current technology and reduce satellite and ground system size, weight, power usage, and cost.
- (U) Start development of optically implemented EHF hopping synthesizer for decreased size and improved performance.
- (U) Start development of EHF omni antenna for secure, anti-jam EHF telemetry, tracking and commanding capability.

(U) FY 1992 Planned Program:
- (U) Start development of 10 Watt Solid State Power Amplifier for 60 GHz standard crosslink.
- (U) Complete phase I of EHF synthesizer effort by demonstrating feasibility of optically generating radio frequencies.
- (U) Complete development of 44 GHz EHF uplink receiver.

(U) FY 1993 Planned Program:
- (U) Complete 60 GHz crosslink low noise amplifier development.
- (U) Complete phase II of EHF synthesizer to include lab model.
- (U) Start SHF adaptive nulling antenna component development.

(U) Work Performed By: Managed by the Phillips Lab, Kirtland AFB NM. Component technology development executed by Rome Lab, Griffis AFB NY. Contractors are Raytheon, Lexington MA, David Sarnoff Research Center, Princeton NJ, General Electric, Valley Forge PA and Syracuse NY, Chang Industries, Pomona CA, and RDL, Culver City CA.

(U) Related Activities:
(U) Canadian Defence Program D6470, EHF SATCOM R&D
(U) Program Element #0602702F, Command/Control/Communications
(U) Program Element #0603250F, Lincoln Laboratory
(U) Program Element #0603789F, Tactical C3 Adv Development
(U) Program Element #0303110F, Defense Sat Comm Sys (DSCS)
(U) Program Element #0303603F, Milstar Sat Comm Sys
(U) Program Element #0603226E, Exp Eval Major Innovative Tech
(U) There is no unnecessary duplication within the USAF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project: 3834, Advanced Spacecraft Technology Integration: This project evaluates space technology programs and demonstrates innovative space technologies and operational concepts. The proposed lead-off experiment is the Electric Insertion Transfer Experiment (ELITE). ELITE will demonstrate highly efficient electric propulsion, lightweight solar arrays, and autonomous navigation and control. Transition of this technology would enable Electric Orbit Transfer Vehicles (EOTV) to increase the payload that can be delivered to geosynchronous orbit, enable

deployment of two satellites with one launch vehicle, or be used to downsize launch vehicles (e.g., replace a Titan IV with a Titan III or Atlas II booster, saving up to $100 million per launch).

(U) FY 1990 Accomplishments:
- (U) No work conducted on this project in FY 90.

(U) FY 1991 Planned Program:
- (U) Detail ELITE mission and experiment objectives.
- (U) Define and execute ELITE Cooperative Research and Development Agreement (CRDA).
- (U) Begin conceptual design and analysis of ELITE experiment.

(U) FY 1992 Planned Program:
- (U) Conduct ELITE preliminary design review.
- (U) Define ELITE booster integration requirements.

(U) FY 1993 Planned Program:
- (U) Conduct ELITE critical design review.
- (U) Detail ELITE booster integration.

(U) Work Performed By: Managed by Phillips Lab, Kirtland AFB NM. Since this is a new FY 91 effort, no contracts have been awarded.

(U) Related Activities:
(U) Program Element #0603302F, Space and Missile Rocket Propulsion
(U) Program Element #0603402F, Space Test Program
(U) There is no unnecessary duplication within the USAF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project: 3977, Thermionic Space Power: This project is conducting a requirements definition and critical technology demonstration of thermionic space nuclear power. Activities can be divided into five categories: system design efforts; critical technology demonstrations; post irradiation examination of components; trade studies; and system modeling.

(U) FY 1990 Accomplishments:
- (U) Awarded 3 contracts for system design studies in Sep 90.
- (U) Project orders issued to government labs for 2 system designs, post irradiation examination of emitter and insulator samples, heat pipe testing, and space nuclear power utility studies.

(U) FY 1991 Planned Program:
- (U) Implement the technology program initiated in FY 90.
- (U) Assess the five system designs and technology status.
- (U) Define AF mission requirements for space nuclear power.
- (U) Perform in-house experiments and analyses.

Program Element: #0603401F Budget Activity: #2 - Adv Technology Development
PE Title: Advanced Spacecraft Technology

(U) FY 1992 Planned Program:
- (U) Complete assessment of system designs and technology status.
- (U) Perform in-house experiments and analyses.
- (U) Detail flight experiment mission and objectives.
- (U) Support selection of thermionic concepts for detailed conceptual design phase.

(U) FY 1993 Planned Program:
- (U) Perform in-house experiments and analyses.
- (U) Monitor performance of conceptual design and critical technology development contracts.
- (U) Define flight experiment integration and testing requirements.

(U) Work Performed By: Managed by Phillips Lab, Kirtland AFB NM. Government organizations include Los Alamos National Lab, Los Alamos NM, Sandia National Lab, Albuquerque NM, Idaho National Lab, Idaho Falls ID. Contractors include GA Technologies, San Diego CA, Rockwell International, Canoga Park CA, Space Power Inc, San Jose CA, and Auburn University, Auburn AL.

(U) Related Activities:
(U) Program Element #0602203F, Aerospace Propulsion
(U) Program Element #0603224C, Surv, Lethality, & Key Spt Tech
(U) SP-100 space nuclear power project by DOE, NASA, and SDIO.
(U) Thermionic Fuel Element Verification by DOE and SDIO.
(U) Draft MOU among DOE, SDIO and USAF Concerning Thermionic Space Nuclear Power Systems.
(U) There is no unnecessary duplication within the USAF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project: 682J, Advanced Space Power Technology: This project develops compact, survivable, non-nuclear satellite power generation, storage, and processing systems. Power generation work is focused on lightweight, low cost and moderately survivable solar arrays. Energy storage work is focused on developing and demonstrating lightweight Nickel-Hydrogen (NiH2) and Sodium-Sulfur (NaS) spacecraft batteries for 5 to 10 year satellite missions. NiH2 batteries are half the mass of existing satellite batteries, and the ongoing life test will demonstrate a 5 year low earth orbit life capability. NiH2 batteries will be transitioned to the Milstar, Defense Meteorological Satellite System (DMSS), and Global Positioning System (GPS) satellites. Even lighter NaS batteries will be ready for deployment in the late 1990's. Power processing efforts focus on producing lightweight, high efficiency, standardized subsystem designs for use on future high power, more survivable Air Force satellites.

Program Element: #0603401F Budget Activity: #2 - Adv Technology Development
PE Title: Advanced Spacecraft Technology

(U) FY 1990 Accomplishments:
- (U) Completed the first NiH2 low earth orbit life test 3 year data. Held the first NiH2 battery life test workshop.
- (U) Launched high efficiency Gallium-Arsenide solar cells as a radiation tolerance flight experiment on the Air Force-NASA Combined Release and Radiation Effects Satellite (CRRES).
- (U) Performed the thin film solar cell assessment to test for electron and proton radiation effects on Amorphous Silicon, Copper Indium Diselenide and Cadmium Telluride solar cells.

(U) FY 1991 Planned Program:
- (U) Begin the NaS flight experiment program to demonstrate microgravity operation of lightweight NaS batteries.
- (U) Transition Gallium-Arsenide solar cells to DMSS and GPS satellites. Gallium-Arsenide solar cells can provide the same power at half the weight of current generation cells.
- (U) Complete the assessment of thin film solar cell technology readiness and cost benefit analysis.

(U) FY 1992 Planned Program:
- (U) Obtain the first NiH2 low earth orbit 5 year life test data. Continue tests to complete statistically valid battery model.
- (U) Initiate the advanced solar array project to meet mid-1990's satellite power requirements at half current costs.
- (U) Initiate demonstration of standard modular designs for lightweight, high voltage, high efficiency power processing equipment.

(U) FY 1993 Planned Program:
- (U) Construct and flight qualify the NaS flight experiment for launch by the Space Test Program.
- (U) Complete power processing equipment designs to significantly reduce the size and begin hardware development.
- (U) Complete High Efficiency Solar Panel flight experiment data reduction and disseminate data to space community.

(U) Work Performed By: Managed by the Phillips Lab, Kirtland AFB NM. Supported by technology programs managed by the Wright Lab, Wright-Patterson AFB OH. Work performed by NASA's Jet Propulsion Laboratory, Pasadena CA, the Naval Weapons Support Center, Crane IN, and Aerospace Corp, El Segundo CA.

(U) Related Activities:
(U) Program Element #0602203F, Aerospace Propulsion
(U) Program Element #0602302F, Rocket Propulsion
(U) Program Element #0603226E, Exp Eval Major Innovative Tech
(U) There is no unnecessary duplication within the USAF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603401F
PE Title: Advanced Spacecraft Technology
Project Number: 2181
Budget Activity: #2 - Advanced Technology Dev

A. (U) RESOURCES ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Advanced Spaceborne Computer Module (ASCM)	8,823	8,500	12,600	13,500	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This Advanced Technology Transition Demonstration will show the capability to manufacture and ensure producibility of high-speed, radiation hardened very high speed integrated circuits (VHSIC), components, wafer scale packages, and subsystems. This program will enable interchangeable, interoperable, and standardized data and signal processing systems for most Air Force and SDI missions at acceptable cost. The Advanced Spaceborne Computer Module (ASCM) program integrates several joint Air Force/SDIO efforts and seeks to develop the critical building blocks for advanced on-board processing technology, independent of system architecture or configuration. The development risk and cost of future on-board data processing systems for Space Systems Division (SSD) will be greatly reduced with the availability of the ASCM submodules as building blocks for these systems, available from multiple sources. ASCM will be 10-30 times faster and 100 times more radiation hard than late 1980's space computer technology. ASCM is baselined for the Advanced Warning System (AWS), Milstar, Navy Space Program, and for some classified satellite systems. The project's scope includes the Technology for Autonomous Operational Survivability (TAOS) program, a satellite survivability demonstration that will prove prototype space computers and other state-of-the-art survivability and autonomy technologies in cooperation with the Defense Advanced Research Project Agency's (DARPA) Advanced Space Technology Program.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Designed the 16-bit ASCM Control Processor Module (CPM) using Generic VHSIC Spaceborne Computer (GVSC) chipsets and 64K Static Random Access Memories (SRAM).
   - (U) Multi-chip package successfully passed functional tests.
   - (U) Completed the Qualified Manufacturer's List (QML) validation process for both contractors which will provide major cost reductions using the principles of Total Quality Management.
   - (U) Successfully fabricated 256K SRAM prototype.
   - (U) Developed CPM prototype and software for TAOS flight computer.
   - (U) Successfully completed testing of first Generic VHSIC Spaceborne Computer (GVSC) flight computer.

Program Element: #0603401F Project Number: 2181
PE Title: Advanced Spacecraft Technology Budget Activity: #2 - Advanced Technology Dev

2. (U) FY 1991 Planned Program:
   - (U) Integrate main memories, input/output devices, and power converters into CPM forming a single functional unit to manage satellite sensor and communications data.
   - (U) Deliver 256K SRAM engineering units to space system users.
   - (U) Validate QML approach to space qualifying radiation-hardened VHSIC devices which will reduce radiation-hardened VHSIC device cost from $2,000 to $750, saving as much as $32 million per satellite.
   - (U) Design a 256K reprogrammable memory that will allow "adaptive" satellites to rewrite their "hard" memories.
   - (U) Deliver three GVSC flight computers to payload integration.

3. (U) FY 1992 Planned Program:
   - (U) Assemble, test, and space qualify first CPMs and deliver to satellite users.
   - (U) Begin design on the 32-bit ATIM.
   - (U) Develop non-volatile memories for insertion into the Advanced Technology Insertion Module (ATIM).
   - (U) Complete TAOS payload integration and launch mission.
   - (U) Start on-orbit mission analysis of TAOS payload performance.

4. (U) FY 1993 Planned Program:
   - (U) Integrate non-volatile memory technologies in ATIM demonstrations.
   - (U) Begin manufacturing process for the submicron technology ATIM.
   - (U) Begin on-array processor study to determine user speed and processing requirements.
   - (U) Begin development of advanced high speed 1 MBit SRAM.
   - (U) Complete TAOS post mission data analysis.

5. (U) Program to Completion:
   - (U) Assemble, test, and space qualify ATIMs and deliver to users.
   - (U) Develop technologies that will enable faster processing.
   - (U) Develop on-array processor technology for system user evaluation.
   - (U) Incorporate processor with sensor array to provide true on-array processing to satisfy speed and processing requirements of sensor technologies.
   - (U) Develop radiation hardening technology improvements to linear circuit devices.

D. (U) WORK PERFORMED BY: Managed by the Phillips Lab, Kirtland AFB NM. The two contractors performing the ASCM effort are Honeywell, Clearwater FL, and IBM, Manassas VA. Contractors for TAOS also include TRW, Redondo Beach CA, Microcosm, Torrance CA, Rockwell, Anaheim CA, Honeywell, Phoenix AZ, GTE, Sunnyvale CA, and the Sandia National Laboratory, Albuquerque, NM.

Program Element: #0603401F | Project Number: 2181
PE Title: Advanced Spacecraft Technology | Budget Activity: #2 - Advanced Technology Dev

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: The number of CPM computers will be reduced from 8 to 1 for each contractor. Total number of parts will remain fixed to validate the QML approach. Quantity reduction is due to budget cuts from funding sources other than this program element.
2. (U) SCHEDULE CHANGES: Honeywell CPM delivery will move to FY 92. ATIM effort has slipped one year. Delays are due to funding cuts from funding sources other than this program element.
3. (U) COST CHANGES: None for this program element.

F. (U) PROGRAM DOCUMENTATION:
(U) Program Management Directive for Advanced Spacecraft Technology, 22 Mar 90.
(U) USSPACECOM MROC 04-88 Integrated Satellite Control System, Jan 88.
(U) AFSPACECOM SON 006-89 (Draft) Space Support, Interoperability and Readiness.
(U) Work Package Directive (WPD) S241.

G. (U) RELATED ACTIVITIES:
(U) Program Element #0102431F, Advanced Warning System
(U) Program Element #0303603F, Milstar Sat Comm Sys
(U) Program Element #0305160F, Defense Meteorological Sat Sys
(U) Program Element #0305165F, NAVSTAR Global Positioning Sys
(U) Program Element #0603226E, Exp Eval of Major Innovative Technology
(U) Program Element #0604609F, R&M for Technical Insertion Programs
(U) Memorandum of Agreement between DARPA's Advanced Space Technology Program and the Air Force Space Test Program.
(U) There is no unnecessary duplication within the USAF or DOD.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1. (U) ASCM

CPM CDR	Apr 91
CPM Qual/Delivery	1QFY92
ATIM PDR	1QFY93
ATIM CDR	4QFY93
ATIM Qual/Delivery	1QFY95

2. (U) TAOS

Payload Deliveries	Oct 90 - Jun 91
Payload Integ and Test	Jul 91 - Nov 91
Spacecraft Build-up & Test	2QFY92 - 4QFY92
Launch	4QFY92
On-orbit Experimentation	4QFY92 - 4QFY93

FY 1992/1993 BIENNIAL RDT&E DECSRIPTIVE SUMMARY

Program Element: #0603402F
PE Title: Space Test Program (STP)

Budget Activity: #6 Defense Wide Mission Support

A.(U) RESOURCES: ($ in thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2617 Free-Flyer Spacecraft Missions	30,428	34,886	52,523	57,745	Cont	TBD
2618 Quick Response Shuttle Missions	0	256	800	1,200	Cont	TBD
2620 Shuttle Sortie Missions	17,936	16,382	0	0	0	N/A
TOTAL	48,364	51,524	53,323	58,945	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Space Test Program (STP) advances DOD technology by providing spaceflight missions for experiments that demonstrate new space systems technologies, concepts and designs, and 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 technologies. It provides a unique service to DOD that is not duplicated except for operational or Defense Acquisition Board programs. STP experiments are flown by priority based on relevance to existing military requirements and the availability of cost-effective means of spaceflight on expendable launch vehicles or the Shuttle. STP is also the pathfinder for exploiting the Shuttle as a manned DOD space laboratory to define military man's role in space.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2618, Quick Response Shuttle Missions: This STP project supports the flight of Quick Response Shuttle Payloads (QRSPs). Due to the simplified integration involved, QRSP experiments maximize the use of near-term flight opportunities on both DOD and NASA Shuttle missions. QRSP experiments make use of Shuttle middeck and aft flight-deck lockers. Available experiment carrying capabilities are acquired through close coordination with NASA. The Military Man-In-Space (MMIS) effort, which uses the QRSP process, develops and evaluates equipment and human tasking in the space environment for specific military applications. Starting in FY 1992, this project funds Shuttle flight charges which directly support QRSP projects.

Program Element: #0603402F Budget Activity: #6 Defense Wide Mission Support
PE Title: Space Test Program (STP)

(U) FY 1990 Accomplishments:
- (U) Eighteen STP experiments (including MMIS) were flown on Shuttle.
- (U) Continue manifesting backlogged experiments and support new experiments as Shuttle capacity allows.

(U) FY 1991 Planned Program:
- (U) Provide inputs for NASA/DOD negotiations on DOD use of the Shuttle after FY 1991.
- (U) Support first MMIS payload specialist flight (Army TERRA SCOUT) on STS-44.

(U) FY 1992 Planned Program:
- (U) Continue supporting new experiments and manifest flights as Shuttle capacity allows.

(U) FY 1993 Planned Program:
- (U) Continue supporting new experiments and manifest flights as Shuttle capacity allows.

(U) Work Performed By: Air Force Systems Command, Space Systems Division, Los Angeles AFB, CA, NASA/Johnson Space Center, Houston, TX. The Aerospace Corporation, El Segundo, CA; Goddard Spaceflight Center, Greenbelt MD.

(U) Related Activities:

(U) Program Element #0305171F (Space Shuttle Operations)
(U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: None.

2. (U) Project 2620, Shuttle Sortie Missions: This STP project advances DOD space technology by flying experiments on Shuttle sortie missions (payloads/experiments which are returned) which demonstrate new technologies, concepts and designs and for determining space environmental effects on military space systems and personnel. Using generic, reusable, standard STP Shuttle experiment support equipment, STP accomplishes its pathfinder role of using the Shuttle as a manned DOD space laboratory. The project develops the capability to control payloads in the payload bay from the aft flight deck as well as the capability to store data and perform experiments on the aft and mid flight decks. This project provides for the procurement of generic reusable experiment support equipment; integration of sortie mission payloads with the Shuttle experiment support equipment and the integration of both into the Shuttle; mission/payload specialist training on STP hardware; launch support; on-orbit support; and science data retrieval.

Program Element: #0603402F
PE Title: Space Test Program (STP)

Budget Activity: #6 Defense Wide Mission Support

(U) FY 1990 Accomplishments:
- (U) Continued AFP-675 spacecraft and experiment integration, system test and operations planning for a FY 1991 flight. The AFP-675 mission includes the Phillips Laboratory's Cryogenic Infrared Radiance Instrument for Shuttle (CIRRIS)-1A and GL's Horizon Ultraviolet Photometer (HUP) and Quadropole Ion Neutral Mass Spectrometer (QUINMS) experiments and the Naval Research Laboratory's (NRL) Far Ultraviolet Camera (FAR UV) experiment.
- (U) Continued development and integration of STP-1 consisting of the Phillips Laboratory Spacecraft Kenetic Infrared Test (SKIRT), NRL's Ultraviolet Limb Imaging Experiment (UVLIE) and Space Systems Division Advanced Liquid Feed Experiment (ALFE).

(U) FY 1991 Planned Program:
- (U) Support the AFP-675 sortie and STP-1 Shuttle flight on STS-39, associated mission operations, post-flight recovery and data distribution.
- (U) Support the spaceflight of Get-Away special (GAS) and hitchhiker experiments on the Space Shuttle.
- (U) This project ends in FY 1991 with the completion of AFP-675. All primary experiments, including Shuttle GAS cans and hitchikers, will be funded under Project 2617 starting in FY 1992.

(U) WORK PERFORMED BY: Air Force Systems Command, Space Division, Los Angeles AFB, CA and NASA Johnson Space Center, Houston, TX; The Aerospace Corporation, El Segundo, CA; NASA Goddard Space Flight Center, Greenbelt, MD; Lockheed Space and Missile Company, Sunnyvale,CA and Kennedy Space Center, Cape Canaveral FL.

(U) RELATED ACTIVITIES:
(U) Program Element #305171F (Space Shuttle Operations) supplies Launch support tasks.
(U) There is no unnecessary duplication of effort within the Air Force of the Department of Defense.

(U) OTHER APPROPRIATION FUNDS: None

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

FY 1992/1993 BIENNIAL RDT&E DECSRIPTIVE SUMMARY

Program Element: #0603402F
PE Title: Space Test Program (STP)
Project Number: 2617
Budget Activity: #6 Defense Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Free-Flyer Spacecraft Missions	30,428	34,886	52,523	57,745	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This STP project advances DOD space technology by providing for the spaceflight of DOD prioritized experiments on STP developed free-flyer spacecraft. All future tri-Service ranked "primary" experiments are serviced by this project. These flights are used for the demonstration of new system technologies, concepts and designs and for determining space environmental effects on military space systems. Historically, 45% of the primary experiments can be satisfied by small satellite (100 to 500 pound class) missions, 35% require medium satellite (500 to 4,000 pounds) missions and 20% fly as piggyback missions. Currently, the Free-Flyer project supports spacecraft development of five expendable launch vehicle (ELV) missions, on-orbit operations of six satellites and integration of seven piggyback experiments on non-STP developed spacecraft. Starting in FY 92, this project funds Aerospace technical support and program office support (civilian pay, travel, supplies).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Continued on-orbit support for P87-2 Space Charging at High Altitude (SCATHA) and P87-1 Polar Bear.
   - (U) Successfully launched P87-2 STACKSAT and P86-1 Combined Release and Radiation Effects Satellite (CRRES).
   - (U) Awarded Space Test Experiment Platform (STEP) contract with STEP mission one to be launched on the AF Small Launch Vehicle).
   - (U) Continued the P89-1 Independent Space Experiment system (ISES) mission consisting of Rome Air Development Center's Radiation Experiment (REX) and Los Alamos National Laboratory's Array of Low Energy X-Ray Imaging Sensors (ALEXIS) experiments.
   - (U) Initiated Air Force Geophysics Laboratory (AFGL's) Automated Charge Control at geosynchronous altitude (CHARGECON-GEO) experiment on the DSCS III.
   - (U) Continued AFGL's Shuttle Potential and Return Electron Experiment (SPREE) on the joint NASA/Italian Tethered Spacecraft mission aboard the Shuttle.
   - (U) Initiated Scout mission for launch of NRL's Passive Radio Frequency Interference Location Experiment (PROFILE) P90-2.
   - (U) Initiated STEP mission zero supporting Phillips Laboratory's Technology for Autonomous Operational Survivability (TAOS) experiment to be launched on a TAURUS launch vehicle.

Program Element: #0603402F
PE Title: Space Test Program (STP)
Project Number: 2617
Budget Activity: #6 Defense Wide Mission Support

- (U) Continued integration of Navy Magnetospheric Atmospheric X-ray Imaging Experiment (MAXIE) and Energetic Heavy Ion Composition (EHIC) on Thermal Infrared Observation Satellite (TIROS)-I.
- (U) Continued integration of Remote Atmospheric & Ionospheric Detection System (RAIDS) on TIROS-J.
- (U) Initiated piggyback mission of NRL's Precise Range and Range Rate Experiment (PRARE) on Global Positioning System.
- (U) Initiated piggyback mission of Middle Atmoshphere High Resolution Spectrograph (MAHRS) on CRISTA-SPAS.
- (U) Initiated piggyback mission of Solar Wind Imaging Experiment (SWIM) on NASA WIND satellite.

2. (U) FY 1991 Planned Program:
   - (U) On-orbit support for SCATHA, Polar Bear, CRRES and STACKSAT.
   - (U) Launch P90-2 PROFILE and provide on-orbit support.
   - (U) Launch REX/ALEXIS experiment aboard P89-1 ISES.
   - (U) Continue STEP missions one (P90-1) and zero (P90-5 TAOS).
   - (U) Initiate Pegasus P90-6 Advanced Photovoltaic and Electronics Experiment (APEX) mission.
   - (U) Initiate the P91-B mission for FY 95 MLV launch.
   - (U) Initiate STEP mission two (P90-B).
   - (U) Continue integration of MAXIE/EHIC, RAIDS, CHARGECON, MAHRS, PRARE, SWIM and SPREE piggyback missions.

3. (U) FY 1992 Planned Program:
   - (U) Support SCATHA, CRRES, STACKSAT, ISES, and PROFILE flight operations and science data collection.
   - (U) Launch Pegasus P90-6 APEX and conduct on-orbit support.
   - (U) Launch STEP mission zero (P90-5 TAOS) and on-orbit operations.
   - (U) Launch SPREE experiment Tethered Spacecraft Shuttle mission.
   - (U) Launch MAXIE/EHIC on TIROS-I mission.
   - (U) Continue STEP missions one (P90-1) and two (P90-B).
   - (U) Initiate STEP mission three (P91-A) and mission four.
   - (U) Continue development/integration of P91-B MLV-class mission.
   - (U) Continue integration of RAIDS, CHARGECON, MAHRS, PRARE and SWIM.

4. (U) FY 1993 Planned Program:
   - (U) Support SCATHA, CRRES, STACKSAT, ISES, APEX, PROFILE and P90-5 flight operations and science data collection.
   - (U) Launch STEP mission one (P90-1) and conduct on-orbit support.
   - (U) Launch POAM, RAIDS, MAHRS and SWIM piggyback missions.
   - (U) Continue development of STEP missions two and three and four.
   - (U) Initiate STEP missions five and six.
   - (U) Continue development/integration of P91-B MLV-class mission.
   - (U) Continue integration of CHARGECON and PRARE.

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

D. (U) WORK PERFORMED BY: Air Force Systems Command, Space Division, Los Angeles AFB, CA, The Aerospace Corporation, El Segundo, CA. Office of

Program Element: #0603402F
PE Title: Space Test Program (STP)
Project Number: 2617
Budget Activity: #6 Defense Wide Mission Support

Naval Research (ONR), Washington, D.C.; Defense Systems, Inc., McLean, VA; NASA/Goddard Space Flight Center, Greenbelt, MD; NASA/Marshall Spaceflight Center, Huntsville, AL; Naval Research Laboratory, Washington, D.C.; and Ball Space Systems Division, Boulder, CO; TRW, Redondo Beach, CA; Orbital Sciences Corporation, VA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: By Congressional direction, this project now includes $9 million in FY 91 funds for the AFGL High-Frequency Active Auroral Research Program (HAARP) which is unrelated to STP.

2. (U) Schedule Changes: The $9M directed reallocation to HAARP delays support to the Extreme Ultraviolet Imager (XUVI) experiment, P91-B and STEP mission two. Delays launch of PROFILE.

3. (U) Cost Changes: None

F. (U) PROGRAM DOCUMENTATION:

- (U) Tri-Service Regulation (AFR 80-2/AR 70-43/OPNAVINST 3913.1), STP Management, 30 November 1984.

G. (U) RELATED ACTIVITIES:

(U) Program Element #305171F (Space Shuttle Operations) supplies launch support tasks.
(U) Program Element #305119F (Space Boosters) procures launch vehicles and their corresponding launch support for STP.
(U) There is no unnecessary duplication of effort within the Air Force or Department of Defense

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: An MOA exists between STP and ONR to secure secondary capacity on the French SPOT-3 spacecraft for ONR's Polar Ozone and Aerosol Measurement (POAM II) experiment.

J. (U) MILESTONE SCHEDULE:

(U)	Scout launch of PROFILE	3Q FY 1991
(U)	Pegasus launch of ISES with REX and ALEXIS	4Q FY 1991
(U)	TIROS launch of MAXIE and EHIC	2Q FY 1992
(U)	Shuttle launch of Tethered Sat/SPREE	2Q FY 1992
(U)	Pegasus launch of APEX	4Q FY 1992
(U)	TIROS launch of RAIDS	1Q FY 1993
(U)	STEP Mission 0 P90-5 TAOS	4Q FY 1992
(U)	STEP Mission 1 P90-1	1Q FY 1993
(U)	Launch SWIM on WIND satellite	1Q FY 1993
(U)	Ariane launch of POAM-II on SPOT-III	2Q FY 1993
(U)	Launch MAHRS on CRISTA-SPAS	3Q FY 1993

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603410F Budget Activity: #2 - Advanced Technology Development
Title: Space Systems Environmental Interactions Technology

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2821 Space Systems Design and Test Standards	680	680	786	710	Cont	TBD
2822 Interactions Measurement Payloads	2,559	3,076	2,780	3,020	Cont	TBD
2823 Charge Monitoring and Control Systems	671	496	1,370	1,322	Cont	TBD
Total	3,910	4,252	4,936	5,052	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program provides demonstrated, cost-effective solutions to counter the adverse effects of space environmental interactions on spacecraft operations. Issues under investigation include: (1) electrostatic discharges inducing phantom commands in geosynchronous satellite systems and possibly causing major subsystem failure, (2) environment-induced operating constraints on new-technology solar arrays operating at high-voltage levels, (3) degradation of space sensor performance caused by outgassed contaminants or spurious optical emissions near the spacecraft, and (4) satellite performance deterioration and reduced lifetime caused by natural radiation and single-event upsets. Operations continue without adequate understanding of these hazardous effects and how to alleviate them, and trends show the problems will worsen with larger and more complex Air Force systems of the future. The payoffs of this work are the capability to engineer around environment-induced effects during system design, operate around performance limitations in space, and mitigate the effects with autonomous monitoring and control systems.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2821, Space Systems Design and Test Standards: This project integrates the results of experiments conducted under Project 2822, Interactions Measurement Payloads, and other DOD and NASA experiments, into tools that are useful to Air Force space systems operators and designers. Results are provided to Space Systems Division in the form of handbooks, standards, or computer-aided engineering (CAE) tools, as applicable. For example, a recently developed computer graphics package shows the design engineer where electric charge builds up, given a particular spacecraft design.

(U) FY 1990 Accomplishments:
- (U) Delivered military standards/handbook on space environment specifications which will be used by satellite program offices in designing new space assets.

Program Element: #0603410F Budget Activity: #2 - Advanced Technology Development
Title: Space Systems Environmental Interactions Technology

(U) FY 1991 Planned Program:
- (U) Begin contamination characterization for computer-aided spacecraft identification and mission assessment tools.
- (U) Begin work on single event upset (SEU)/cosmic ray characterization model for electronic component design.

(U) FY 1992 Planned Program:
- (U) Complete preliminary spacecraft mission assessment tool.
- (U) Complete new military standards/handbook/guidelines on spacecraft surface charging.

(U) FY 1993 Planned Program:
- (U) Complete initial draft of new military standards/handbook on radiation testing of microelectronic components.
- (U) Deliver final spacecraft mission assessment tool.
- (U) Complete SEU/cosmic ray characterization model.

(U) Work Performed By: This project is managed by the Geophysics Directorate of AFSC's Phillips Laboratory, Hanscom AFB MA. The top five contractors are S-Cubed, Inc., La Jolla CA; Spectral Sciences, Inc., Burlington MA; Radex, Inc., Bedford MA; Lockheed Palo Alto Research Laboratory, Palo Alto CA; and the University of Chicago, Chicago IL.

(U) Related Activities:
(U) NASA/USAF Space Technology Interdependency Group coordinates efforts and reviews programs annually.
(U) Program Element 0602101F, Geophysics.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

2. (U) Project 2822, Interactions Measurement Payloads: In order to effectively counter adverse spacecraft-environment interactions, in-space demonstrations must be conducted to determine the effects of environmental interactions with large space structures in orbit. Investigations include interactions with electrical power systems; electrostatic discharge effects; degradation in thermal insulators and sensors that leads to overheating; and internal arcing, spurious detector signals, and logic errors or command upsets in the control electronics. A coordinated technology demonstration with AFSC's Wright Laboratory will quantify the performance limitations of new-technology solar arrays operating at high voltage levels, and their long-term deterioration from exposure to space radiation. Another task will develop models of contamination interactions for spacecraft mission assessment. Results will transition under Project 2821, Space Systems Design and Test Standards.

Program Element: #0603410F Budget Activity: #2 - Advanced Technology Development
Title: Space Systems Environmental Interactions Technology

(U) FY 1990 Accomplishments:
- (U) Completed fabrication and testing of Photovoltaic Array Space Power Plus Diagnostics (PASP Plus) brassboard.
- (U) Completed fabrication of Shuttle Potential and Return Electron Experiment (SPREE) instrument for large space structure modelling.
- (U) Obtained spectra and images of Shuttle glow and thruster plumes from the Shuttle-borne Auroral Photography Experiment (APE-B).
- (U) Tested and integrated Shuttle Glow (GLO) ultraviolet contamination imager and spectrograph.

(U) FY 1991 Planned Program:
- (U) Begin fabrication of PASP Plus flight unit.
- (U) Complete fabrication of all hardware for the low-altitude spacecraft charging experiment.
- (U) Validate Spacecraft Contamination Model by comparing with data from APE-B and GLO experiments.

(U) FY 1992 Planned Program:
- (U) Launch SPREE instrument on joint NASA-Italian Space Agency Tethered Space Satellite (STS-46).
- (U) Deliver PASP Plus to STP for Pegasus flight integration.

(U) FY 1993 Planned Program:
- (U) Launch PASP Plus technology demonstration aboard Pegasus.
- (U) Complete preliminary analysis of SPREE data.
- (U) Complete contamination signature model for spacecraft mission assessment tools.

(U) Work Performed By: This project is managed by the Geophysics Directorate of AFSC's Phillips Laboratory, Hanscom AFB MA. The contractors are Amptek Inc., Bedford MA; Northeastern University, Boston MA; Panametrics Inc., Waltham MA; and S-Cubed, Inc., La Jolla CA.

(U) Related Activities:
- (U) NASA/USAF Space Technology Interdependency Group coordinates efforts and reviews programs annually.
- (U) Program Element 0602101F, Geophysics.
- (U) Program Element 0603401F, Advanced Spacecraft Technology.
- (U) Program Element 0603438F, Satellite Systems Survivability.
- (U) Program Element 0603402F, Space Test Program.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

Program Element: #0603410F Budget Activity: #2 - Advanced Technology Development
Title: Space Systems Environmental Interactions Technology

3. (U) Project 2823, Charge Monitoring and Control Systems: The Air Force needs the capability to prevent electrical charge buildup and the resulting disabling discharge on its operational satellites. For geosynchronous spacecraft, a charge control system (CCS) technology demonstration has been developed. Results from the demonstration aboard a Defense Satellite Communications System (DSCS) satellite will validate the concept of autonomous active charge control and provide an engineering design to Space Systems Division. For low/medium altitude satellites, a Compact Environmental Anomalies Sensor (CEASE) will be developed to provide warning of environmental conditions likely to produce anomalous behavior in satellite operations.

(U) FY 1990 Accomplishments:
- (U) Concluded spaceflight plan and obtained manifest on DSCS for CCS technology demonstration.
- (U) Completed design and fabrication of CCS flight controller.

(U) FY 1991 Planned Program:
- (U) Complete CCS flight controller software and flight unit.
- (U) Initiate preliminary feasibility study for CEASE.

(U) FY 1992 Planned Program:
- (U) Complete CCS flight unit testing and calibrations.
- (U) Deliver CCS to STP for DSCS integration.
- (U) Complete CEASE feasibility study.

(U) FY 1993 Planned Program:
- (U) Launch CCS technology demonstration aboard DSCS.
- (U) Collect preliminary data on CCS operation.
- (U) Begin breadboard development of CEASE.

(U) Work Performed By: This project is managed by the Geophysics Directorate of AFSC's Phillips Laboratory, Hanscom AFB MA. The two contractors are Amptek, Inc., Bedford MA; and Assurance Technology Corp., Carlisle MA.

(U) Related Activities:
- (U) NASA/USAF Space Technology Interdependency Group coordinates efforts and reviews programs annually.
- (U) Program Element 0602101F, Geophysics.
- (U) Program Element 0603402F, Space Test Program.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603428F Budget Activity: #2 - Adv Technology Development
PE Title: Space Subsystems Technology

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
4096 Surveillance Technology Integration	0	0	1,900	2,900	Cont	TBD
4097 Space Environment	0	0	480	250	Cont	TBD
4098 Sensor Signal Processing Technology Development	0	1,000	4,575	5,500	Cont	TBD
4099 Next Generation Radar Technology Demonstration	0	0	18,145	27,251	Cont	TBD
Total	0	1,000	25,100	35,901	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element has been restructured into a Science and Technology (S&T) program based on the 2 Nov 90 Acquisition Decision Memorandum for Space Based Wide Area Surveillance. The program is now focused on phased array radar wide area surveillance component development, utility demonstrations and supporting technologies. This is the Air Force's primary source of wide area surveillance advanced technology development. This program includes efforts to identify and quantify the space environment impact or surveillance and development of space phased array and signal processing technologies. Program also includes two advanced technology demonstration efforts: a series of integrated brass-board ground demonstrations; and a larger scale, flight demonstration. These key demonstrations will integrate radar and infrared technologies to provide an understanding of the synergistic advantages and the requirements/effects on the many spacecraft subsystems. They will also enable confident transition of innovative wide area surveillance technologies to operational system development and lessen the development risk and associated cost. Technologies to be developed include algorithms for signal processing, sensor components and registration, and experimental payload development and integration. Negotiations are underway with NASA to make the flight demonstration a joint effort between the USAF and NASA. Canadian participation is anticipated in both the ground demonstration and the flight demonstration. This program supports sensitive radar development efforts identified in the 1991 Defense Critical Technologies Plan.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 4096, Surveillance Technology Integration: The objective is to investigate component interactions and understand design impacts on system performance, cost, and reliability. This will include activity to assess operational requirements relative to

technology alternatives to define the most beneficial radar and multi-spectral technology programs and demonstrations necessary for insertion into future wide area surveillance systems.

(U) FY 1990 Accomplishments:
- (U) None.

(U) FY 1991 Accomplishments:
- (U) None.

(U) FY 1992 Planned Program:
- (U) Begin investigation of the integration of radar sensor elements with spacecraft power, control, structure, on-board processor, command and control, and survivable subsystems appropriate to wide area surveillance system applications.
- (U) Begin to quantitatively determine relative advantages of other sensor adjuncts to radar for wide area surveillance.
- (U) Evaluate and integrate the Navy's complementary infrared sensor development and demonstration program results.
- (U) Begin to evaluate the most promising wide area surveillance technologies.
- (U) Define wide area surveillance space experiments and utility demonstrations.

(U) FY 1993 Planned Program:
- (U) Continue integration demonstrations and subsystem developments of space surveillance technologies.
- (U) Investigate subsystem reliability and technology for subsystem components.
- (U) Define measurements required for HAVE GAZE extended range test as defined by expected operational needs.

(U) Work Performed By: Managed by the Directorate of Space Technology of the Phillips Laboratory, Kirtland Air Force Base, NM. This is a new project.

(U) Related Activities:
(U) PE 0602702F, Command, Control, Communications, and Intelligence.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 4097. Space Environment: This project will identify and quantify the impact of ionosphere and space debris on wide area surveillance. Mitigation techniques and environmental models will be developed for both areas.

(U) FY 1990 Accomplishments:
- (U) None.

(U) FY 1991 Accomplishments:

Program Element: #0603428 Budget Activity: #2 - Adv Technology Development
Title: Space Subsystems Technology

- (U) None.

(U) FY 1992 Planned Program:
- (U) Begin development of ionospheric model and mitigation techniques applicable to wide area surveillance.
- (U) Initiate space debris characterization program in the orbits of interest to wide area surveillance.

(U) FY 1993 Planned Program:
- (U) Complete Ionospheric model and mitigation techniques.
- (U) Begin space debris modeling and threat assessment.

(U) Worked Performed By: Managed by the Directorate of Space Technology of the Phillips Laboratory, Kirtland Air Force Base, NM. This is a new project.

(U) Related Activities:
(U) PE 0603707, Weather Systems Advanced Development.
(U) PE 0602101F, Geophysics.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: (U) None.

(U) International Cooperative Agreements: (U) Not Applicable.

3. (U) Project 4098, Sensor Signal Processing Technology Development: This project will provide for the continuing development of HAVE GAZE technology.

(U) FY 1990 Accomplishments:
- (U) None.

(U) FY 1991 Accomplishments:
- (U) Successful detection demonstrated using the HAVE GAZE algorithms/signal processing in fixed ground site emitter/receivers.

(U) FY 1992 Planned Program:
- (U) Conduct an in-depth technical review and establish long-term critical milestones for sensor/signal processor development and demonstration.
- (U) Conduct a preliminary operational utility analysis for military applications including target detections in regional conflicts and drug interdiction.
- (U) Determine hardware size and performance constraints necessary to perform the extended range HAVE GAZE experiments.
- (U) Perform experiments and analyze experiment data and update phenomenological and space system application models for target detection and counter countermeasures.

(U) FY 1993 Planned Program:
- (U) Conduct simulation and modeling studies to determine future program milestones.
- (U) Prepare for integration of HAZE GAZE technology into a flight experimental demonstration of target detection and tracking.

Program Element: #0603428 Budget Activity: #2 - Adv Technology Development
Title: Space Subsystems Technology

(U) Worked Performed By: Managed by the Directorate of Space Technology of the Phillips Laboratory, Kirtland Air Force Base, NM. Contractors include Research and Development Laboratories, Culver City, CA. Other contractors will be selected via competition.

(U) Related Activities:
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: (U) Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

1992/1993 NEW RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603428F
PE Title: Space Subsystems Technology
Project Number: 4099
Budget Activity: #2 - Adv Tech Devel

A. (U) Resources ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Next Generation Radar Technology Demonstrations	0	0	18,145	27,250	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
This project will provide for development of detection algorithms, antenna and computer hardware, and antenna control software focused on a near term ground demonstration. The far-term effort will focus on integrating these technologies on a space based platform. Approaches for platforms will include examination of the NASA Earth Observation System Synthetic Aperture Radarfor demonstration applicability as well as well as utility of a technology demonstrator "X-vehicle" in space. Emphasis for the flight demonstration will be on light weight phased array antenna technology, electronic counter measures and clutter suppression techniques, and space qualified or qualifiable hardware (Transmit/Receive (T/R) modules & signal processors). The final flight configuration is planned based on technology trade analysis and recommendations from the planned joint USAF/NASA/Canadian team.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) None.

2. (U) FY 1991 Planned Program:
   - (U) None.

3. (U) FY 1992 Planned Program:
   - (U) Begin development of structural dynamics and control technology for wide area surveillance, emphasizing low weight and tight dynamic control.
   - (U) Begin high power RF feed technology development.
   - (U) Begin development of a breadboard adaptive nulling processor.
   - (U) Begin construction of breadboard antenna test article.
   - (U) Begin development of the advanced T/R modules for space applications.

4. (U) FY 1993 Planned Program:
   - (U) Begin development of advance structural dynamics and control technology for wide area surveillance.
   - (U) Continue high power RF feed technology development.
   - (U) Complete advanced T/R module program.
   - (U) Continue development of a breadboard adaptive nulling processor.

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

D. (U) Work Performed By: This project will be managed by the Director of Space Technology of the Phillips Laboratory, Kirtland AFB, NM. This

Program Element: #0603428F
PE Title: Space Subsystems Technology

Project Number: 4099
Budget Activity: #2 - Adv Technology Development

is a new project.

E. (U) Comparison with FY 1991 Descriptive Summary:
- (U) Technical changes: Not Applicable.
- (U) Schedule changes: Not Applicable.
- (U) Cost changes: Not Applicable.

F. (U) Program Documentation:
(U) Multi-Command Required Operational Capability (MROC) 2-87.
(U) Mission Need Statement (MNS), JROC-SM-88-083, 28 Nov 88.
(U) SBWAS Combatant Command Requirements (CCRs), 13 Oct 89.
(U) Space Based Atmospheric/Surface Surveillance System SORD, 008-87-I, 23 Apr 90.

G. (U) Related Activities:
(U) PE 0602702F, Command, Control, Communications.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) Other Appropriation Funds: (U) Not Applicable.

I. (U) International Cooperative Agreements: A Data Exchange Agreement (DEA) has been signed with Canada on space based surveillance. A similar Information Exchange Program (IEP) data sharing agreement has been signed with the United Kingdom. Additionally, a memorandum of Understanding (MOU) is in draft between the US and Canadian governments covering cooperative wide area surveillance technology development. This MOU is planned to be negotiated and signed after funding restrictions are lifted by Congress. Canada has an ongoing space based radar technology program and has identified approximately $1 billion for development and fielding of an operational system.

J. (U) Milestone Schedule:

1.	(U) Complete Ground Demonstrations	FY 1994
2.	(U) Space Based Demonstrations	FY 1998

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603438F Budget Activity: #6 - Defense Wide Mission Support
PE Title: Satellite Systems Survivability

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2611 Survivability Planning Analysis	2028	800	300	400	Cont	TBD
2612 Satellite Survivability	8,849	8,963	8,381	3,105	Cont	TBD
2613 Ground Station/Link Survivability	240	543	0	100	Cont	TBD
Total	11,117	10,306	8,681	3,605	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program performs survivability planning and analysis and develops the necessary prototype hardware, software, technology, operational procedures, strategy and tactics 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 system elements: satellites, data/command links, and ground stations. Space systems are required to provide critical strategic and tactical navigation, surveillance, communications and meteorological information. These systems provide support to strategic, tactical, and special operations forces on a global basis. The capabilities to interfere with our data links and ground stations, the potential use of the Soviet operational anti-satellite (ASAT) and their advances in developing a ground-based laser which, under optimum conditions, could be used against our satellites represent major threats to our effective use of U.S. space systems. Failure to protect our space systems could result in the denial of their critical support to the National Command Authorities and our military forces during crisis and conflict. The major development efforts within this program are the Satellite Attack Reporting System (SOARS) and Technology for Autonomous Operational Survivability (TAOS). SOARS is a demonstration of an attack detection, characterization, and attack reporting system, composed of a suite of modular sensors which can be tailored to specific satellite threats, which is planned for incorporation into all upcoming satellite block changes. TAOS is a limited dissemination (LIMDIS) program for a free-flying space demonstration of several autonomy and survivability technologies. Survivability technologies under this program element are made available to all satellite program offices for system level implementation.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2611, Survivability and Planning Analysis: Performs analysis and planning to meet space system survivability requirements.

Program Element: #0603438F Budget Activity: #6 - Defense Wide Mission Support
PE Title: Satellite Systems Survivability

(U) FY 1990 Accomplishments:
- (U) Began analysis of designs for satellite system augmentation and implications of deployment
- (U) Developed survivability program roadmap, including investment strategies
- (U) Began analysis of moderate maneuver effects on satellite survivability and operational mission performance
- (U) Continued analyses of evolution of the threat, technology needs, development priorities, and operational requirements
- (U) Began analysis of survivable satellite command and control
- (U) Continue to develop analysis tools which allow tradeoffs to be conducted between various survivability options

(U) FY 1991 Planned Program:
- (U) Continue analysis of satellite system augmentation
- (U) Continue analysis of impact of satellite maneuvers and begin operational concept studies for a centralized maneuver control facility
- (U) Continue analyses of evolution of the threat, technology needs, development priorities, and operational requirements
- (U) Continue analysis of survivable satellite command and control
- (U) Continue to develop analysis tools for survivability option tradeoffs, including affects on optimum production and launch scheduling

(U) FY 1992 Planned Program
- (U) Complete operational concept studies for a centralized maneuver control facility
- (U) Continue analyses of evolution of the threat, technology needs, development priorities, and operational requirements
- (U) Coordinate Air Force space survivability planning. Update the survivability roadmap and investment strategies
- (U) Continue development of analysis tools for survivability trade studies, complete production/launch scheduling tool

(U) FY 1993 Planned Program:
- (U) Continue to update the survivability roadmap and investment strategies
- (U) Continue to develop analysis tools

(U) Work Performed By: The Air Force Systems Command's Space Systems Division, Los Angeles, CA, has overall responsibility for program management. Space Systems Division executes the program, has responsibility for contractor overview and performs technical analysis in support of this project.

(U) Related Activities:
- (U) Program Element #0603218C, SDI Research and Support Activities

Program Element: #0603438F Budget Activity: #6 - Defense Wide Mission Support
PE Title: Satellite Systems Survivability

- (U) Program Element #0305110F, Satellite Control Facility
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2612, Satellite Survivability: Develops and demonstrates satellite survivability technologies in support of space system program offices. Satellite On-Board Attack Reporting System (SOARS) and Technology for Autonomous Operational Survivability (TAOS) are the current major efforts.

(U) FY 1990 Accomplishments:
- (U) Completed SOARS Preliminary Design Review
- (U) Continued development of TAOS payload and awarded TAOS spacecraft bus contract

(U) FY 1991 Planned Program:
- (U) Complete SOARS Critical Design Review
- (U) Complete TAOS payload development; start payload integration with spacecraft bus, and mission rehearsals
- (U) Complete SOARS replanning for FY93 Space Test Program (STEP) launch

(U) FY 1992 Planned Program: Funding at FY91 level required to:
- (U) Complete SOARS hardware development
- (U) Complete TAOS spacecraft/payload integration and testing
- (U) Launch and operate TAOS on STEP Mission 0 using DARPA's Taurus launch vehicle

(U) FY 1993 Planned Program:
- (U) Launch and operate SOARS on STEP Mission 2
- (U) Continue on-orbit operations of TAOS
- (U) Begin payload mission analysis and reporting

(U) Work Performed By: The Air Force Systems Command's Space Systems Division, Los Angeles, CA, manages SOARS. The SOARS contract is with Lockheed, Sunnyvale, CA. The Aerospace Corporation, Los Angeles, CA, provides system engineering support for SOARS to Space Systems Division, Los Angeles, CA. The TAOS payload contracts are with: Microcosm, Torrance, CA; GTE, Mountain View, CA; Honeywell, Phoenix, AZ; Rockwell, Anaheim, CA; TRW, Redondo Beach, CA; Intelligent Interactive Imagery Corp, Foster City, CA; and Sandia National Laboratory, Albuquerque, NM. Phillips Laboratory, Albuquerque, NM, manages the TAOS development effort.

(U) Related Activities:
- (U) Program Element #0602601F, Advanced Weapons

Program Element: #0603438F Budget Activity: #6 - Defense Wide Mission Support
PE Title: Satellite Systems Survivability

- (U) Program Element #0604711F, Systems Survivability
- (U) Program Element #0603218C, SDI Research and Support Activities
- (U) Program Element #0603401F, Advanced Spacecraft Technology
- (U) Program Element #0603211F, Aerospace Structures and Materials
- (U) Program Element #0305110F, Satellite Control Facility
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2613, Ground Station/Link Survivability: Develops techniques to improve survivability of satellite ground stations, communications links, and smart satellites. Includes space segment survivability technologies for the Integrated Satellite Control System (ISCS)

(U) FY 1990 Accomplishments:
- (U) ISCS Program survivability requirements were prioritized; supported multi-service working groups
- (U) Supported ISCS Program Plan and Acquisition Strategy

(U) FY 1991 Planned Program:
- (U) Integrated Satellite Control Modeling task will be completed. This modeling tool will allow lower cost/reduced manpower system to be designed

(U) FY 1992 Planned Program:
- (U) No planned activity

(U) FY 1993 Planned Program:
- (U) Perform planning and analysis to improve communications connectivity for satellite control all levels of conflict

(U) Work Performed By: The Air Force Systems Command's Space Systems Division, Los Angeles, CA, with technical assistance from Aerospace Corp., Los Angeles, CA, performs this task.

(U) Related Activity:
- (U) Program Element #0305110F, Satellite Control Facility
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603601F Budget Activity: #2 - Advanced Technology Development
Title: Conventional Weapons Technology

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
670A Ordnance Technology	11,969	14,975	17,645	17,176	Cont	TBD
670B Air-to-Surface Guidance Technology	11,312	13,625	14,076	14,254	Cont	TBD
670E Air-to-Air Guidance Technology	0	100	1,900	3,500	Cont	TBD
Total	23,281	28,700	33,621	34,930	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is the primary Air Force advanced technology development program for air-to-surface and air-to-air weapons including guidance, ordnance, and aeromechanics technologies. Hardware and software are demonstrated and evaluated to determine feasibility, effectiveness, and potential operational value of promising technologies. This program performs risk-reduction activities to facilitate transition from exploratory development to system prototypes.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

(U) Project 670E: AIR-TO-AIR GUIDANCE TECHNOLOGY. This project develops and demonstrates advanced air-to-air guidance technologies. The emphasis is on short to medium range weapons against future threats. Objectives include increased acquisition range, improved target acquisition, enhanced autonomous seeker operation, reduced miss distances, more reliable operation and enhanced affordability. Efforts are focused on a multi-mode seeker which combines infrared (IR) and radio frequency (RF) guidance technologies. The above improvements allow all weather operation, more tactical flexibility, and improved survivability.

(U) FY 1990 Accomplishments:
- (U) None.

(U) FY 1991 Planned Program:
- (U) Define threat and develop basic system parameters for a multi-mode (combined IR & RF) air-to-air missile seeker.
- (U) Initiate in-house support activities for development of a multi-mode brassboard suitable for captive carriage.
- (U) Develop inhouse multi-mode seeker simulation and analysis capability to support program initiation and subsequent evaluation of multi-mode seeker performance.

(U) FY 1992 Planned Program:
- (U) Continue in-house multi-mode seeker simulation and analysis to support program initiation and subsequent evaluation of multi-mode seeker performance.

Program Element: #0603601F Budget Activity: #2 - Advanced Technology Development
PE Title: Conventional Weapons Technology

- (U) Initiate a multi-mode air-to-air seeker development program.
- (U) Establish multi-mode seeker concept definition and establish processor architecture.
- (U) Conduct System Parameters Review for Multi-Mode Seeker.

(U) FY 1993 Planned Program:
- (U) Complete development of simulation design tool for multi-mode seeker, select critical component design/suppliers and complete the detailed design.
- (U) Initiate fabrication of seeker breadboard.

(U) Work Performed By: Wright Laboratory's Armament Directorate, Eglin AFB FL, is the responsible technical activity. The test facilities at the Air Force Development Test Center, Eglin AFB FL, support this program. Contractors for the multi-mode seeker development effort have not been selected.

(U) Related Activities:
- (U) PE 0602602F, Conventional Munitions.
- (U) PE 0603363F, Armament Technology Integration.
- (U) PE 0602111N, Anti-Air/Anti-Surface Warfare Technology.
- (U) PE 0603792N, Advanced Technology Demonstrations.
- (U) The Joint Navy/Air Force Memorandum of Agreement on Tactical Air-to-Air Missiles, dated May 1988, applies.
- (U) There is no duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603601F
PE Title: Conventional Weapons Technology
Project Number: 670A
Budget Activity: #2-Advanced Technology Development

A. (U) RESOURCES ($ in Thousands):

Project Title: Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Ordnance Technology	11,969	14,975	17,645	17,176	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project develops and demonstrates the feasibility, effectiveness and operational value of conventional (non-nuclear) ordnance technologies for current and future air-delivered weapons. Project develops technologies for: fuzes, insensitive and less sensitive explosives, hard target warheads, explosives, bombs, submunitions and their dispensing mechanisms, guns and ammunition, air-to-surface composite weapon airframes, smart submunitions, and weapon ordnance subsystems. Objectives include: increased munitions and transportation safety and increased on-base ordnance storage through qualification of Insensitive High Explosives (IHE); demonstration of an advanced medium range dispenser for increased operational effectiveness against high value buried and hardened targets; effective enemy airfield denial; increased aircraft gun effectiveness; multiple kills per pass; advanced combat ammunition; more effective submunition dispensing; low drag composite weapons airframes; increased tactical mission choices and improved missile performance.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Completed ground and captive flight test of the laser diode smart submunition sensor for real time acquisition and classification.
   - (U) Completed gun firings for validation of cased telescoped ammunition technical design package.
   - (U) Completed Hard Target Ordnance Technology Phase II component design/test; 12 sled impact tests and a static rocket motor firing. Demonstrated 14' reinforced concrete penetration and a programmable fuze which counts the layers penetrated.
   - (U) Demonstrated ability of AFX 920 explosive to withstand detonation of an adjacent bomb.
   - (U) Performed analysis and design/development of an ordnance package for Advanced Medium Range Air-to-Air Missile Pre-Planned Product Improvement and future air-to-air missiles.

2. (U) FY 1991 Planned Program:
   - (U) Initiate analysis of low cost standoff weapon technologies.
   - (U) Conduct preliminary qualification tests for melt cast and plastic bonded explosive mixtures for Insensitive High Explosive (IHE) safety classification.
   - (U) Complete subsystem integration and test of hard target penetration technologies designed to defeat heavily hardened targets, demonstrating technology required for transition to the Boosted Penetrator full-scale development program.

Program Element: #0603601F
PE Title: Conventional Weapons Technology
Project Number: 670A
Budget Activity: #2-Advanced Technology Development

- (U) Complete definition of parameters, technology assessments and develop design components for the air-to-air ordnance package.
- (U) Conduct system level sled tests of the hard target ordnance package tri-pack in a GBU-15 (dispenser version) test vehicle.
- (U) Conduct captive flight tests of the laser diode smart submunition sensor against ground clutter and countermeasures.
- (U) Conduct testing of large diameter, smart submunition, self-forging fragment, warhead.

3. (U) FY 1992 Planned Program:
   - (U) Complete component proof-of-concept testing and design form-factored components for air-to-air ordnance package.
   - (U) Conduct safety tests for MK-80 series and BLU-109 bombs filled with IHE.
   - (U) Complete FMU-139 fuze reconfiguration for use with IHE for the Insensitive Munitions (IM) Technology program and conduct sled tests to demonstrate fuze function.
   - (U) Flight test a solid rocket powered Have Slick weapon airframe to demonstrate 20 mile low altitude standoff range.
   - (U) Conduct smart submunition warhead testing to verify its ability to function as both a fragmenting and forged-fragment warhead.
   - (U) Complete integration testing of hard target ordnance package for defeat of high value buried targets.

4. (U) FY 1993 Planned Program:
   - (U) Complete component form, fit, and function testing and initiate design and demonstration for the air-to-air ordnance package.
   - (U) Initiate high performance IHE development for smart submunition warheads.
   - (U) Conduct performance and flight tests of IHE filled MK-82 bombs.
   - (U) Initiate studies of the Low Cost Anti-Armor Submunition for integration into standoff weapon concepts.
   - (U) Initiate analysis of low cost inertial and terminal guidance into standoff weapon concepts.

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

D. (U) WORK PERFORMED BY: Wright Laboratory's Armament Directorate, Eglin AFB FL is responsible for program management and technical activity. Test facilities at the Air Force Development Test Center, Eglin AFB FL; Arnold Engineering Development Center, TN; 6585th Test Group, Holloman AFB NM; and the Naval Weapons Center, China Lake CA, support this program. Major contractors are: McDonnell-Douglas, St Louis MO; Lockheed Missile and Space Division, Sunnyvale CA; Motorola Inc, Scottsdale AZ; and Aerojet Inc, Sacramento CA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Not Applicable.
2. (U) SCHEDULE CHANGES: Not Applicable.
3. (U) COST CHANGES: Not Applicable.

Program Element: #0603601F | Project Number: 670A
PE Title: Conventional Weapons Technology | Budget Activity: #2-Advanced Technology Development

F. (U) PROGRAM DOCUMENTATION:
- (U) TAF GOR 302-78, Wide Area Anti Armor Munitions (WAAM), 13 Feb 78
- (U) TAF SON 306-79, Airfield Attack Munitions, 8 Mar 79
- (U) TAF ROC 311-75, Improved Cluster Munitions, 28 May 75
- (U) SAC SON 18-82, Strategic Conventional Standoff Capability, 19 Jun 84
- (U) AFLC SON 02-83, Munitions Hazard Reduction, 20 May 85
- (U) TAF SON 306-85, Multi-Purpose All-Up Round Development, 24 Mar 87
- (U) TAF SON 309-88, Reducing the Risk of Munitions Operations, 22 May 89
- (U) TAF SON 305-85, Hard Target Munitions, 20 May 85.

G. (U) RELATED ACTIVITIES:
- (U) PE 0602602F, Conventional Munitions
- (U) PE 0604602F, Armament/Ordnance Development
- (U) PE 0604314F, Advanced Medium Range Air-to-Air Missile
- (U) PE 0603363F, Armament Technology Integration
- (U) PE 0602111N, Anti-Air/Anti-Surface Warfare Technology
- (U) PE 0603792N, Advanced Technology Demonstrations
- (U) There is no duplication of effort within the Air Force or the Department of Defense.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1.	(U) Completed development of HAVE Slick weapon airframe	FY 1990
2.	(U) Complete Hard Target Technology subsystem integration	FY 1991
3.	(U) Hard Target Ordnance Technology demonstration	FY 1992
4.	(U) Complete air-to-air ordnance package proof of concept	FY 1992
5.	(U) Complete 1.6 Hazard Classification tests of Insensitive High Explosive	FY 1992
6.	(U) Begin low cost dispenser subsystem integration studies	FY 1993
7.	(U) Complete air-to-air ordnance package form, fit function and integration testing	FY 1993

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603601F
PE Title: Conventional Weapons Technology
Project Number: 670B
Budget Activity: #2-Advanced Technology Development

A. (U) RESOURCES ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Air-to-Surface Guidance	11,312	13,625	14,076	14,254	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project develops and demonstrates advanced and autonomous, all-weather, near-zero circular error probability terminal guidance technologies. Objectives include: standoff delivery/threat avoidance through pre-programmed autonomous seeker operation, target acquisition; precision terminal guidance with increased accuracy, all-weather operation, and increased tactical flexibility; enhanced target classification and identification; improved countermeasures-resistant seeker capability; increased affordability; and increased tactical mission choices. Technologies exploited for guidance applications include laser radar (LADAR), Synthetic Aperture Radar (SAR) and millimeter wave (MMW).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Completed design of LADAR guidance systems under the Advanced Technology LADAR Seeker (ATLAS) program.
   - (U) Completed medium-speed flight testing of two Autonomous Synthetic Aperture Radar Guidance (ASARG) systems.
   - (U) Completed preliminary analysis for the Millimeter wave, Infrared, Common Aperture Seeker (MICAS) program.

2. (U) FY 1991 Planned Program:
   - (U) Develop and flight test midcourse position update, terrain following and obstacle avoidance capability Synthetic Aperture Radar (SAR) seekers under ASARG to demonstrate standoff weapon applications.
   - (U) Modify and conduct tests (captive flight) of ASARG seeker against high value fixed targets, mobile missile launchers and massed armored targets.
   - (U) Conduct utility analysis, target acquisition algorithm development and advanced guidance study to support the ATLAS seeker system.
   - (U) Complete the design and fabrication phase of the ATLAS program.
   - (U) Conduct initial ATLAS captive flight testing to demonstrate application to tactical weapons.

3. (U) FY 1992 Planned Program:
   - (U) Complete Advanced Technology LADAR Seeker (ATLAS) demonstration for autonomous short range air-to-surface missile applications with midcourse and terminal guidance capability.
   - (U) Conduct ATLAS captive flight test on medium speed aircraft.

Program Element: #0603601F Project Number: 670B
PE Title: Conventional Weapons Technology Budget Activity: #2-Advanced Technology Development

- (U) Update ATLAS seeker and integrate it into final configuration for pod-mounted seeker on high speed aircraft.
- (U) Collect and analyze concurrent millimeter wave and infrared air-to-surface target and background data.
- (U) Develop Millimeter wave, Infrared, Common Aperture Seeker (MICAS) components/subsystems and algorithms.

4. (U) FY 1993 Planned Program:
   - (U) Conduct ATLAS high speed captive flight tests to demonstrate high speed scanning in conjunction with real time processing at acquisition and during terminal guidance.
   - (U) Perform MICAS aircraft hardware/software integration analysis.
   - (U) Complete MICAS brassboard fabrication and begin captive flight testing.
   - (U) Validate the adverse weather in-flight performance of MICAS.

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

D. (U) WORK PERFORMED BY: Wright Laboratory's Armament Directorate, Eglin AFB FL, is responsible for program management and technical activity. Test facilities at Munitions Systems Division, Eglin Air Force Base FL support this program. The two prime contractors are: Raytheon Co, Bedford MA; Loral, Phoenix AZ.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Not Applicable.
2. (U) SCHEDULE CHANGES: Not Applicable.
3. (U) COST CHANGES: Not Applicable.

F. (U) PROGRAM DOCUMENTATION:

(U) TAF SON 306-79, Airfield Attack Munitions, 8 Mar 79
(U) TAF ROC 311-79, Self-Protection Weapon, 30 Mar 79
(U) TAF SON 3133-81, Communications/Jammer Killer, 24 May 82
(U) TAF SON 311-75, Improved Cluster Munitions, 28 May 75
(U) SAC SON 18-82, Strategic Conventional Standoff Capability, 19 Jun 84
(U) TAF SON 314-82, Standoff Attack Weapon, 17 Aug 82.

G. (U) RELATED ACTIVITIES:

(U) PE 0602602F, Conventional Munitions.
(U) PE 0603363F, Armament Technology Integration.
(U) PE 0602111N, Anti-Air/Anti-Surface Warfare Technology.
(U) PE 0603792N, Advanced Technology Demonstrations.
(U) PE 0604407D, Joint Standoff Weapon.
(U) There is no duplication of effort within the Air Force or the Department of Defense.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

P am Element: #0603601F
P. le: Conventional Weapons Technology
Project Number: 670B
Budget Activity: #2-Advanced Technology Development

J. (U) MILESTONE SCHEDULE:

1.	(U) Complete Autonomous Synthetic Aperture Radar Guidance (ASARG) captive flight testing	FY 1991
2.	(U) Complete design and fabrication of laser radar seeker	FY 1991
3.	(U) Complete Millimeter wave, Infrared, Common Aperture Seeker (MICAS) seeker breadboard fabrication	FY 1992
4.	(U) Complete laser radar seeker ground tests	FY 1992
5.	(U) Laser radar seeker demonstration	FY 1993
6.	(U) Complete MICAS seeker brassboard hardware fabrication	FY 1993
7.	(U) Initiate Dual Role Seeker program planning	FY 1993

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603605F
PE Title: Advanced Weapons Technology
Budget Activity: #2-Advanced Technology Development

A. (U) Resources ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3150 High Energy Laser and Optics Technology	1,704	4,978	6,716	6,500	Cont	TBD
3151 Phased Integrated Laser Optics Technology (PILOT)	15,852	16,967	16,564	13,504	Cont	TBD
3152 High Power Microwave Technology	8,239	9,410	9,851	9,800	Cont	TBD
3277 Systems Survivability	283	478	497	400	Cont	TBD
3647 Ground Based Laser Technology	37,335	22,561	23,524	21,003	Cont	TBD
Total	63,413	54,394	57,152	51,207	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is the advanced technology development program for directed energy (DE) concepts for Air Force applications. Major technology breakthroughs in removing optical atmospheric distortions, fabricating small phased arrays of laser diodes, and understanding the effects of high power microwave (HPM) devices have been demonstrated and further development will continue. Major areas of emphasis include; directed energy weapon technologies for ground based lasers and HPM sources, high resolution long range optical imaging for applications such as space object identification, laser diode arrays, and effects of DE and nuclear weapons on US systems.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 3150, High Energy Laser & Optics Technology: This project concentrates on nonlinear optics (NLO) and phased multiple telescopes. NLO can correct optical distortions and facilitate coupling and pointing laser beams very efficiently without high cost optics and processing systems. Coupling efficiently combines the outputs from several independent laser devices. The physics of NLO permit a significant breakthrough in long range optical imaging in and through the atmosphere. Optical telescopes focus the laser beam on the target and/or collect light in an imaging system. Multiple telescope systems allow the replacement of large imaging and beam pointing optics by small, off-the-shelf optical telescopes. An imaging subsystem is required in a high energy laser for accurate placement and maintenance of the beam on target and to perform damage assessment. These technologies have significant application to astronomical research in both techniques and hardware.

Program Element: #0603605F
PE Title: Advanced Weapons Technology

Budget Activity: #2-Advanced Technology Development

(U) FY 1990 Accomplishments:
- (U) Fabricated full scale multiple telescope imaging optics.
- (U) Demonstrated multiple telescope combining concept.
- (U) Demonstrated near real-time high resolution imaging using a phased array of telescopes.

(U) FY 1991 Planned Program:
- (U) Develop and evaluate illuminator for active imaging.
- (U) Use nonlinear optics (NLO) properties of a bulk crystal to optically couple fiber optic lasers and demonstrate self-alignment.
- (U) Begin fabrication of NLO imaging brassboard for first real-time image distortion removal using optical techniques.

(U) FY 1992 Planned Program:
- (U) Demonstrate high resolution imaging techniques on 3.5 meter telescope for space object identification applications.
- (U) Demonstrate pre-compensated passive imaging for advanced tracking and aimpoint maintenance applications.
- (U) Demonstrate coupling of several high power laser diodes on a single strip using an NLO crystal.

(U) FY 1993 Planned Program:
- (U) Deliver and field test NLO imaging brassboard.
- (U) Demonstrate new generation imaging sensor.
- (U) Demonstrate active imaging on 3.5 meter telescope using a high power illuminator.

(U) Work Performed By: The Lasers and Imaging Directorate of the Phillips Laboratory, Kirtland Air Force Base, NM conducts major in-house research efforts and manages the project. The top five contractors are: Rockwell Power Services Co, Albuquerque, NM; R&D Associates, Marina del Rey, CA; S Systems Corp, Einglewood CA; and University of Arizona, Optical Sciences Center, Tuscon AZ.

(U) Related Activities:
(U) PE 0602601F, Advanced Weapons.
(U) PE 0603217C, Follow-on Systems.
(U) PE 0602102F, Materials.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3152, High Power Microwave Technology: This project supports development of high power microwave (HPM) generation technologies and a susceptibility/vulnerability/lethality data base to identify potential vulnerabilities of US systems to HPM threat parameters and to provide a basis for future weaponization

Program Element: #0603605F Budget Activity: #2-Advanced Technology Development
PE Title: Advanced Weapons Technology

decisions. Representative systems/subsystems will be tested to determine their susceptibilities.

(U) FY 1990 Accomplishments:
- (U) Completed conversion of F-16 testbed, Maverick missile test methodology demonstration, and ultra-wideband tests on Maverick and AIM-9L missiles.

(U) FY 1991 Planned Program:
- (U) Begin development of compact driver for airborne high power microwave (HPM) source.
- (U) Complete high power solid state microwave source module to support near term user feasibility evaluation.
- (U) Begin low power microwave testing on F-16 testbed for first evaluation of HPM against fly-by-wire technology.
- (U) Begin operation of High Energy Research and Technology Facility.

(U) FY 1992 Planned Program:
- (U) Complete 1 kilojoule repetitively pulsed device essential for field testing and technology transition.
- (U) Begin operation of new High Energy Microwave Laboratory.
- (U) Explore a concept for a high power radiofrequency weapon based on user priorities and technology maturity.
- (U) Complete the design of a gigawatt class solid state HPM array.

(U) FY 1993 Planned Program:
- (U) Complete assessment of F-16 testbed to HPM.
- (U) Complete gigawatt class square 25 element solid state array HPM device to explore weaponization.
- (U) Complete target characterization for aircraft self-protection technology demonstration.

(U) Work Performed By: The Advanced Weapons and Survivability Directorate of the Phillips Laboratory, Kirtland Air Force Base, NM performs major in-house research and manages this program. The top five contractors are: Rockwell International Corp, Rocketdyne Division, Canoga Park, CA; Maxwell Laboratories, San Diego, CA; Power Spectra Inc, Fremont CA; Verac Inc, Ball Systems Engineering Division, San Diego, CA; and Kaman Sciences Corp, Dikewood Division, Albuquerque, NM.

(U) Related Activities:
(U) The High Power Microwave Executive Steering Group coordinates efforts in this project with the Army, Navy, other Department of Defense agencies, and the Department of Energy.
(U) PE 0602601F, Advanced Weapons.
(U) PE 0602120A, Electronic Survivability and Fuzing Technology.
(U) PE 0602101N, Directed Energy Weapons.
(U) PE 0602202F, Human Systems Technology.
(U) PE 0602204F, Aerospace Avionics.

Program Element: #0603605F
PE Title: Advanced Weapons Technology

Budget Activity: #2-Advanced Technology Development

(U) PE 0603743F, Electronic Combat Technology.
(U) PE 0603737D, Balanced Technology Initiative.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3277, Systems Survivability: This project develops methodologies and technologies to evaluate and enhance the survivability of Air Force systems during a nuclear attack.

(U) FY 1990 Accomplishments:
- (U) Began major redesign of existing electromagnetic pulse test equipment to simulate DoD Standard 2169A waveforms.

(U) FY 1991 Planned Program:
- (U) Complete development of specific nuclear hardening techniques for ground systems.

(U) FY 1992 Planned Program:
- (U) Begin development of improved nuclear simulation field test measurement, recording, and reduction systems.

(U) FY 1993 Planned Program:
- (U) Complete design guidelines for preventing electron-caused electromagnetic pulse (EMP) damage and transition to MILSTAR and other satellites.

(U) Work Performed By: The Advanced Weapons Directorate of the Phillips Laboratory, Kirtland Air Force Base, NM manages this program. No contracts heve been awarded.

(U) Related Activities:
(U) PE 0602601F, Advanced Weapons.
(U) PE 0602204F, Aerospace Avionics.
(U) PE 0604711F, Systems Survivability (Nuclear Effects).
(U) PE 0602715H, Defense Nuclear Agency.
(U) PE 0603749F, Command, Control, Communication Countermeasures Advanced Systems.
(U) PE 0604747F, Electromagnetic Radiation Test Facilities.
(U) PE 0604312F, ICBM Modernization.
(U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603605F
PE Title: Advanced Weapons Technology
Project Number: 3151
Budget Activity: #2-Advanced Technology Development

A. (U) Resources ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Phased Integrated Laser Optics Technology (PILOT)	15,852	16,967	16,564	13,504	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: PILOT is a

Due to their semiconductor nature, these diodes can be designed for specific applications and do not use the often toxic fuels of other lasers such as chemical lasers. Using a concept developed in-house, this project attempts to

This is done by

The PILOT program has provided the significant funding in gallium arsenide (GaAs) laser diodes and has developed individual laser diodes with a 10-fold increase in power. This technology is already seeing transitions. It has also greatly advanced several special fabrication techniques which will be used in industry. This technology has many applications in the public sector such as hand held lasers for surgery. Current PILOT array technology is available only in the infrared (IR) wavelengths that are very close to the visible. Some military applications, ould require additional wavelengths.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Began development of a technique for system volume reduction.
   - (U) Began development of mid-IR (3-4 microns) laser diodes for high brightness applications.
   - (U) Demonstrated 22 watt 400 element coherent two-dimensional array.
   - (U) Demonstrated a 1 watt 2.3 micron diode at room temperature (demonstrated new physics principles).

2. (U) FY 1991 Planned Program:
   - (U) Demonstrate 2 watt resonant optical cavity breadboard laser.

Program Element: #0603605F
PE Title: Advanced Weapons Technology
Project Number: 3151
Budget Activity: #2-Advanced Technology Development

- (U) Complete user-oriented low power technology transition studies.
- (U) Fabricate an advanced 2-dimensional array on a GaAs wafer.

3. (U) FY 1992 Planned Program:
   - (U) Demonstrate producibility of high quality, coherent, linear, surface and edge emitting laser diode modules to allow low cost mass production of components.
   - (U) Couple four, subscale, two-dimensional diode modules to support technology demonstration.
   - (U) Demonstrate fabrication of laser diode array wafers with a 10 times yield improvement.
   - (U) Demonstrate 25 watt resonant optical cavity system.

4. (U) FY 1993 Planned Program:
   - (U) Demonstrate 30-50 watt phased array of laser diode modules.
   - (U) Demonstrate room temperature mid-infrared wavelength laser diode to remove cryogenic cooling requirement.
   - (U) Demonstrate 2 watt mid-IR breadboard laser system.

5. (U) Program to Completion:
   - (U) This is a continuing program.
   - (U) Transition technology to low and medium power applications.
   - (U) Develop one cubic-foot system.
   - (U) Develop one cubic-foot mid-IR system.

D. (U) WORK PERFORMED BY: The Lasers and Imaging Directorate of the Phillips Laboratory, Kirtland Air Force Base, NM, performs major in-house research and manages this program. The five top civilian contractors are: McDonnell Douglass, St Louis, MO; SRI, David Sarnoff Research Center, Princeton, NJ; TRW, Redondo Beach, CA; Spectra Diode Laboratories Inc, San Jose, CA; and Hughes Research Laboratories, Malabu, CA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Not Applicable.
2. (U) SCHEDULE CHANGES: Not Applicable.
3. (U) COST CHANGES: Not Applicable.

F. (U) PROGRAM DOCUMENTATION:
(U) SON Aerospace Defense Command 03-79, 30 Nov 79.
(U) SON SAC 09-81, 22 Sep 81.
(U) SON SAC 13-81, 28 Sep 81.

G. (U) RELATED ACTIVITIES:
(U) Program Element 0602601F, Advanced Weapons.
(U) Program Element 0602204F, Aerospace Avionics.

Program Element: #0603605F
PE Title: Advanced Weapons Technology
Project Number: 3151
Budget Activity: #2-Advanced Technology Development

(U) Program Element 0603250F, Lincoln Laboratory.
(U) Representatives from Army, Navy, Strategic Defense Initiative Office, National Laboratories, and Air Force using commands are members of the government review team for PILOT.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1.	(U) Advanced Design Array Demonstration	FY 1991
2.	(U) Low Power Transitions Begin	FY 1991
3.	(U) Moderate Power External Cavity Demonstrator	FY 1992
4.	(U) Low Power Module Transitions Begin	FY 1992
5.	(U) 50 Watt Class Demonstrations	FY 1993
6.	(U) Demonstrate 20 watt, Mid-Infrared Source	FY 1995
7.	(U) One Cubic-Foot 100 Watt System	FY 1997
8.	(U) One Cubic-Foot Mid-Infrared System	FY 1999

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603605F
PE Title: Advanced Weapons Technology
Project Number: 3647
Budget Activity: #2-Advanced Technology Development

A. (U) Resources ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Ground Based Laser (GBL) Technology	37,335	22,561	23,524	21,003	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project develops and demonstrates technology and conducts detailed system assessments needed to develop a ground based laser antisatellite (ASAT) weapon. The project will develop detailed system concepts, establish satellite vulnerability, and demonstrate the critical technologies for: (1) scalable laser devices; (2) specific optical components; and (3) required laser beam control to efficiently compensate and propagate the laser radiation through the atmosphere to a target in space. Correcting the laser beam for atmospheric disturbances is the key technology. The beam control technology developed in this project could have significant benefit to the astronomical community.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Demonstrated subscale atmospheric compensation performance.
   - (U) Conducted optimization experiments to improve COIL performance.
   - (U) Conducted field experiments demonstrating baseline satellite tracking concepts.
   - (U) Developed initial satellite vulnerability assessments for six top priority targets.

2. (U) FY 1991 Planned Program:
   - (U) Begin evaluation of advanced oxygen generator and nozzle concepts for a COIL device on a scaled laboratory testbed.
   - (U) Complete moderate-scale laser testing and evaluation of an innovative concept for cooled high energy laser optics.
   - (U) Complete coupled resonator experiment to establish feasibility as a modular scaling path for high energy lasers.
   - (U) Complete integration and begin field testing of a second generation adaptive optics system on the existing 1.5 meter telescope to support atmospheric compensation research.
   - (U) Install and begin field check-out of a 1 meter beam director to support active tracking and imaging field experiments.
   - (U) Complete the fabrication of the 3.5 meter telescope for full scale beam control development and demonstration.

Program Element: #0603605F
PE Title: Advanced Weapons Technology
Project Number: 3647
Budget Activity: #2-Advanced Technology Development

- (U) Complete update of satellite vulnerability assessments for highest priority targets.
- (U) Complete interim system definition and cost/risk optimizations.

3. (U) FY 1992 Planned Program:
   - (U) Complete laboratory testing of advanced COIL technologies and identify most promising concepts.
   - (U) Demonstrate performance of advanced atmospheric compensation technology through field experiments on 1.5 meter telescope.
   - (U) Activate 3.5 meter telescope and begin field check out of first generation adaptive optics.
   - (U) Using the 1 meter beam director, demonstrate ability to illuminate satellite targets for active imaging experiments and begin development of a moderate power illuminator laser to support future active tracking experiments.
   - (U) Begin development of second generation adaptive optics for 3.5 meter telescope.
   - (U) Perform satellite vulnerability assessments for additional targets.
   - (U) Begin analysis to evaluate implications of aimpoint designation and maintenance requirements based on satellite vulnerability assessments.

4. (U) FY 1993 Planned Program:
   - (U) Develop and test scaled component hardware to establish suitability and performance of advanced concepts for high power COIL devices.
   - (U) Begin development of scaled optical components to establish technology basis and reduce risk for full scale GBL ASAT systems.
   - (U) Acquire moderate power illuminator laser and begin field integration with the 1 meter beam director to support active tracking experiments.
   - (U) Conduct first closed loop atmospheric compensation experiments using 3.5 meter telescope.
   - (U) Begin refinement of system concepts in response to progress in technology development, updated risk assessments and satellite vulnerability updates.

5. (U) Program to Completion:
   - (U) This is a continuing program.
   - (U) Further develop specific technologies for selected system concepts.
   - (U) Conduct an integrated beam control experiment to demonstrate at full scale all technology components and a level of integrated performance which meets the requirements for a GBL ASAT system.
   - (U) Finalize satellite vulnerability assessments, system concept definition, performance/effectiveness analysis, and risk assessments to support OSD decision for GBL ASAT.

Program Element: #0603605F
PE Title: Advanced Weapons Technology
Project Number: 3647
Budget Activity: #2-Advanced Technology Development

D. (U) WORK PERFORMED BY: The Lasers and Imaging Directorate of the Phillips Laboratory, Kirtland Air Force Base, NM, performs major in-house research and manages this program. The five top civilian contractors are: AVCO Everett Research Laboratory, Everett, MA; Rockwell Power Service Company, Albuquerque, NM; R&D Associates, Marina del Rey, CA; Rocketdyne Division, Rockwell International, Canoga Park, CA; and The Optical Sciences Company, Placentia, CA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Air Force participation in MIRACL upgrades descoped and Army participation in cooperative program was terminated.
2. (U) SCHEDULE CHANGES: DAB Milestone I decision delayed.
3. (U) COST CHANGES: Not Applicable.

F. (U) PROGRAM DOCUMENTATION:
(U) Mission Need Statement (MNS) for Space Control Antisatellite Capability, 19 May 1988, (S).
(U) Acquisition Decision Memorandum (ADM), Antisatellite Systems, 6 March 1989, (S).
(U) USSPACECOM Antisatellite Concept of Operations (CONOPS), 12 Oct 1989, (S).
(U) Requirements for an ASAT Program, MJCS 201-86, Joint Chiefs of Staff, 22 Sept 1988, (S).
(U) USSPACECOM Multicommand Required Operational Capability (MROC) 03-87 for a Space Control ASAT Capability, Joint Chiefs of Staff, SM-77-88, 5 Feb 1988, (S).

G. (U) RELATED ACTIVITIES:
(U) PE 0602601F, Advanced Weapons.
(U) PE 0102424F, SPACETRACK
(U) PE 0603217C, Follow-on Systems.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1.	(U) Install 3.5 Meter Telescope	FY 1991
2.	(U) Activate 3.5 Meter Telescope	FY 1992
3.	(U) Atmospheric Compensation Uplink Demo	FY 1993
4.	(U) Install Full Scale Adaptive Optics And Beam Control Components	FY 1994

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603617F Budget Activity: #4 - Tactical Programs
PE Title: Command, Control & Communications (C3) Applications

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2314 Tactical Air Surveillance	1,111	1,334	100	100	Cont	TBD
2317 Tactical Air Information Production & Distr.	1,910	1,971	100	936	Cont	TBD
2321 Tactical Battle Information Management	3,862	3,993	3,099	3,100	Cont	TBD
3804 Tactical Air Forces Systems Integration	411	589	100	200	Cont	TBD
Total	7,294	7,887	3,399	4,336	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Rapidly transitions developments in the Science and Technology base to existing C3 programs or directly to warfighting commands. Projects are directly responsive to operational requirements for improved battle management, communications, and surveillance capability. Takes advantage of advanced technology developments throughout the services and industry as well as off-the-shelf technology. Products are primarily advanced development models, rapid prototype efforts, and software.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH 1992 AND FY 1993:

1. (U) Project 2314, Tactical Air Surveillance: Develops advanced technology and demonstrates equipment improvements to the Tactical Air Control System (TACS) ground surveillance radars. Investigate non-radar and/or adjunct radar sensors to address the TAF surveillance, detection and tracking requirements not satisfied by an active radar.

(U) FY 1990 Accomplishments:
- (U) Developed transmitter design specification for a power panel for the solid state transmitter for the AN/TPS-75 radar, principle ground sensor for the TACS.
- (U) Continued investigation of non-radar/adjunct-radar sensors.

(U) FY 1991 Planned Program:
- (U) Begin development of two solid state power panels for the AN/TPS-75 transmitter.
- (U) Initiate multiple sidelobe canceler improvement analysis.
- (U) Complete analysis of non-radar and/or adjunct radar sensors.

Program Element: #0603617F Budget Activity: #4 - Tactical Programs
PE Title: Command, Control & Communications (C3) Applications

(U) FY 1992 Planned Program:
- (U) Continue solid state transmitter panel development and testing.

(U) FY 1993 Planned Program:
- (U) Complete solid state transmitter panel development and testing.
- (U) Initiate system improvement configuration development for integration into AN/TPS-75 radar.

(U) Work Performed By: Rome Laboratory, Griffiss AFB, NY, conducts project efforts. Raytheon Co, Wayland, MA and Precision Science Application Inc, Arlington, VA support the radar trade-off studies.

(U) Related Activities:
(U) Program Element #0603789F, Tactical Air Command, Control, and Communications Advanced Development.
(U) Program Element #0603742F, Combat Identification Technology.
(U) Program Element #0207411F, Overseas Air Weapons Control Systems.
(U) Program Element #0207412F, Tactical Air Control System Improvements (TACSI).
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2317, Tactical Air Information Production & Distribution: This project transitions Advanced Communications Technology to the TACS.

(U) FY 1990 Accomplishments:
- (U) Continued prototype of the Enhanced Multinet Gateway (EMG) to provide a multi-level secure data switch.
- (U) Initiated certification requirements for EMG with Air Force Communications Security Command (AFCSC).
- (U) Continued working EMG test plans and preparation of test sites at TAC and Rome Laboratory.

(U) FY 1991 Planned Program:
- (U) Complete test plans and preparation of test sites at TAC and Rome Laboratory.
- (U) Complete prototypes of the EMG and deliver four to HQ TAC and four to Rome Laboratory.
- (U) Start EMG testing

(U) FY 1992 Planned Program:
- (U) Complete EMG testing.
- (U) Begin transition of the EMG to FSD.

Program Element: #0603617F Budget Activity: #4 - Tactical Programs
PE Title: Command, Control & Communications (C3) Applications

(U) FY 1993 Planned Program:
- (U) Complete transition of EMG to FSD.
- (U) Initiate development of the Enhanced Media Resource Controller prototype.

(U) Work Performed By: Rome Laboratory, Griffiss AFB, NY, conducts project efforts and Falcon Communications, Colorado Springs, CO is the EMG contractor.

(U) Related Activities:
(U) PE #0602702F, Command, Control, and Communications.
(U) PE #0303126F, Long Haul Communications (DCS)
(U) PE #0603789F, Tactical Command, Control, and Communications Advanced Development.
(U) PE #0207411F, Overseas Air Weapons Control Systems.
(U) PE #0207412F, Tactical Air Control Systems Improvements.
(U) PE #0207423F, Advanced Communication Systems.
(U) PE #0603790D, NATO Research and Development.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2321, Tactical Battle Information Management: This project prototypes an Advanced Planning System (APS) decision aid. APS will supply combat planners with an automated capability to pull together the information on resources, weaponeering options, and the current situation that will reduce time to generate the Air Tasking Order (ATO) by a factor of ten.

(U) FY 1990 Accomplishments:
- (U) Developed and delivered to the Tactical Testbed three of the four APS evaluation prototypes (EPs).
- (U) Initiated APS Independent Verification and Validation (IV&V) and user evaluations.
- (U) Initiated APS/Contingency TACS Automated Planning System (CTAPS) interface development.

(U) FY 1991 Planned Program:
- (U) Deliver APS final prototype and the two Functional Common Cores to HQ TAC.
- (U) Continue APS IV&V and initiate efforts to install APS into the TAF theaters.
- (U) Completed APS/CTAPS integration.

(U) FY 1992 Planned Program:
- (U) Begin installation of APS in TAF theaters.

(U) FY 1993 Planned Program:
- (U) Complete installation of APS in TAF theaters.

Program Element: #0603617F Budget Activity: #4 - Tactical Programs
PE Title: Command, Control & Communications (C3) Applications

(U) Work Performed By: Rome Laboratory, Griffiss AFB, NY, manages the program. UNISYS, St Paul, MN is the prototype contractor.

(U) Related Activities:
(U) PE #0602702F, Command, Control, and Communications.
(U) PE #0207411F, Overseas Air Weapons Control Systems
(U) PE #0207421F, Tactical Air Control System Improvements.
(U) PE #0207423F, Advanced Communication Systems.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements:
- (U) USAFE will negotiate an agreement with NATO prior to incorporating APS into the EIFEL system.
- (U) PACAF will negotiate an agreement with the Republic of Korea and Japan prior to incorporating APS into the Constant Watch system.

4. (U) Project 3804, TAF System Integration: Provides integration and engineering support for TAF Battle Management Programs.

(U) FY 1990 Planned Program:
- (U) Completed security analysis of the Wing Command and Control System (WCCS).
- (U) Analyzed intelligence systems and databases needed for Advanced Planning System (APS) theater deployments.

(U) FY 1991 Planned Program:
- (U) Continue analysis of intelligence systems and databases needed for APS theater deployments.
- (U) Initiate a long-term multi-level security insertion plan for TAC and the development community.

(U) FY 1992 Planned Program:
- (U) Complete the long-term multi-level security insertion plan for TAC and the development community.
- (U) Initiate development of system level plans for Tactical Battle Management prototypes and their integration into the operating theaters.

(U) FY 1993 Planned Program:
- (U) Continue development of system level plans for Tactical Battle Management prototypes and their integration into the operating theaters.

(U) Work Performed By: Rome Laboratory, Griffiss AFB, NY, manages the project. MITRE Incorporated, Bedford MA, provides engineering support.

Program Element: #0603617F Budget Activity: #4 - Tactical Programs
PE Title: Command, Control & Communications (C3) Applications

(U) Related Activities:
(U) PE #0603250F, Lincoln Laboratory
(U) PE #0603401F, Advanced Spacecraft Technology
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603707F Budget Activity: #2 - Advanced Technology Development
Title: Weather Systems Advanced Development

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2688 Battlefield Weather Observation and Forecast System	3,264	3,429	3,253	3,582	Cont	TBD
2781 Next Generation Weather Radar	404	425	400	400	Cont	TBD
4026 Environmental Technology Transition	1,705	1,768	1,880	1,700	Cont	TBD
Total	5,373	5,622	5,533	5,682	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program provides demonstrated technologies to improve Air Weather Service's (AWS) environmental support programs critical to the success of Air Force and Army combat missions. The program goal is to provide the capability for real-time alerting of mission-limiting weather events in support of combat operations worldwide.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2688, Battlefield Weather Observation and Forecast System: Improves the Air Force's ability to gather, integrate, and interpret target weather information in data-denied battle areas. Techniques will be developed to fuse weather data from different sources and times into a single data base critical to support the tactical battlefield. Develops Electro-Optical Tactical Decision Aids (EOTDAs) to account for how weather conditions affect the ability of television, infrared, or radar sensors to find a target. These computer models and algorithms will provide us the capability to put smart weapons on target in spite of poor weather conditions.

(U) FY 1990 Accomplishments:
- (U) Completed concept validation of battlefield weather sensors.
- (U) Began weather data fusion effort for battlefield weather forecasting.
- (U) Completed development of daytime automated visibility/cloud sensor.

(U) FY 1991 Planned Program:
- (U) Demonstrate automated visibility sensor for tactical weather observing.
- (U) Complete physical model of generic building target, and continue modeling other targets, sensors, and backgrounds for EOTDAs.
- (U) Continue development of automated cloud detection sensors for tactical weather observing.
- (U) Develop techniques/procedures for analyzing fused weather data.

Program Element: #0603707F Budget Activity: #2 - Advanced Technology Development
Title: Weather Systems Advanced Development

(U) FY 1992 Planned Program:
- (U) Complete weather data fusion effort for battlefield weather forecasting.
- (U) Complete testing of target detection criteria for EOTDAs.
- (U) Add T-72 and M-60 tanks, and generic targets to EOTDAs.
- (U) Begin development of automated cloud detection sensor.
- (U) Begin work on tactical weather forecasting models.

(U) FY 1993 Planned Program:
- (U) Add high-value and generic targets to EOTDAs.
- (U) Implement target detection criteria in EOTDAs.
- (U) Complete testing of automated cloud detection sensor.

(U) Work Performed By: This project is managed by the Geophysics Direcorate of AFSC's Phillips Laboratory, Hanscom AFB MA. High-value target modeling is being done by Wright Research and Development Center, Wright-Patterson AFB OH. The top five contractors are Science and Technology Corp., Hampton VA; Dynamics Research Corp., Wilmington MA; ST Systems Corp., Lanham MD; University of California at San Diego, San Diego CA; and Georgia Institute of Technology, Atlanta GA.

(U) Related Activities:
- (U) Program Element 0305111F, Weather Service.
- (U) Program Element 0305160F, Defense Meteorological Satellite Program.
- (U) Program Element 0602101F, Geophysics.
- (U) Program Element 0604707F, Weather Systems Engineering Dev.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

2. (U) Project 2781, Next Generation Weather Radar: Develops new radar analysis techniques for the WSR-88D Doppler Weather Radar (formerly known as the Next Generation Weather Radar (NEXRAD)). This program is managed at the joint DOD/DOC/DOT NEXRAD Program Office. This technology promises dramatic improvement in our ability to observe and forecast severe weather such as wind shear, tornadoes, and hail, and will allow us to better protect valuable combat assets.

(U) FY 1990 Accomplishments:
- (U) Transitioned hail-size forecasting tool to NEXRAD Program Office.
- (U) Transitioned small-scale wind shear algorithm to NEXRAD Program Office.

Program Element: #0603707F Budget Activity: #2 - Advanced Technology Development
Title: Weather Systems Advanced Development

(U) FY 1991 Planned Program:
- (U) Complete wind discontinuity and non-severe weather tracking algorithms
- (U) Start severe icing detection techniques.
- (U) Start automated hail prediction techniques.

(U) FY 1992 Planned Program:
- (U) Begin tropical storm tracking and intensity specification techniques.

(U) FY 1993 Planned Program:
- (U) Complete severe icing detection algorithm.
- (U) Complete automated hail prediction algorithm.

(U) Work Performed By: This project is managed by the Geophysics Directorate of AFSC's Phillips Laboratory, Hanscom AFB MA. The only contractor is ST Systems Corp., Lanham MD.

(U) Related Activities:
- (U) Program Element 0305111F, Weather Service.
- (U) Program Element 0602101F, Geophysics.
- (U) Program Element 0604707F, Weather Systems Engineering Dev.
- (U) Joint DOD/DOC/DOT Next Generation Weather Radar Program.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

3. (U) Project 4026, Environmental Technology Transition: Develops new operational forecasting tools for the earth's upper atmosphere, ionosphere, and magnetosphere that will satisfy Air Weather Service's requirements to provide environmental observing and forecasting support to weapon systems operating in an unfriendly natural environment. For example, solar storms are very difficult to forecast, and those which occurred in 1989 caused many spacecraft anomalies and tracking difficulties, and even caused a low-orbiting satellite to reenter the earth's atmosphere.

(U) FY 1990 Accomplishments:
- (U) Completed computer specification models of the earth's magnetosphere.
- (U) Completed global ionospheric specification model.
- (U) Began integrated space environment modeling/forecasting system.
- (U) Completed neutral atmospheric model for the 250-1500km altitude range.
- (U) Completed viewing-angle bias correction for infrared satellite sensors.

Program Element: #0603707F Budget Activity: #2 - Advanced Technology Development
Title: Weather Systems Advanced Development

(U) FY 1991 Planned Program:
- (U) Begin regional-scale weather analysis and forecasting tools.
- (U) Complete moisture-to-cloud conversion algorithm.
- (U) Begin viewing-angle bias correction for visible satellite sensors.
- (U) Begin neutral atmospheric model for the 140-250km altitude range.
- (U) Begin algorithms for converting ultraviolet satellite measurements into ionospheric specification.

(U) FY 1992 Planned Program:
- (U) Complete neutral atmospheric model for the 90-140km altitude range.
- (U) Complete upper atmospheric density forecasting models for spacecraft tracking operations.
- (U) Begin development of global stratospheric forecasting model.

(U) FY 1993 Planned Program:
- (U) Complete magnetospheric forecasting model.
- (U) Develop ionosphere/thermosphere electrodynamic model and couple with neutral atmospheric models.
- (U) Develop parameterizations for solar wind transport algorithms.
- (U) Complete testing of global stratospheric forecasting model.

(U) Work Performed By: This project is managed by the Geophysics Directorate of AFSC's Phillips Laboratory, Hanscom AFB MA. The top five contractors are Rice University, Houston TX; Boston University, Boston MA; University of Michigan, Ann Arbor MI; Computational Physics, Inc., Annandale VA; and RMA Aerospace, Mountain View CA.

(U) Related Activities:
- (U) Program Element 0305111F, Weather Service.
- (U) Program Element 0305160F, Defense Meteorological Satellite Program.
- (U) Program Element 0602101F, Geophysics.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603714F Budget Activity: #4 - Tactical Programs
PE Title: DOD Physical Security Equipment - Exterior

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
0001 Delta USAFE Physical Security Equipment - Exterior						
	-0-	-0-	741	573	510	1,824
Total	-0-	-0-	741	573	510	1,824

NOTE: The Air Force normally receives RDT&E monies from OSD PE 0603228D to fund this type of project. However, this project is being funded through PE 0603714F. The remaining Air Force requirements will continue to be funded by PE 0603228D.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Program Element supports the advanced 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 advanced development tasks in three functional areas: detection, systems communications, and imaging. A Department of Defense need exists for a family of standardized modular equipment which can be integrated 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.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 0001, Delta USAFE Physical Security Equipment - Exterior: This project provides advanced development efforts for a sensor system that will detect an intruder(s) at a distance of 2.5 KM from a protected resource in open terrain while emphasizing mobility and minimum man-power requirements for protecting dispersed nuclear-laden aircraft. Using thermal imagery and machine intelligence, the system will determine the type of target (human, animal or vehicle), its range and azmuth from the resource, and its intent (i.e., armed) at a distance sufficient to provide two minutes warning of the approach of hostile forces and sound the alarm to security forces.

(U) FY 1990 Accomplishments: Not Applicable.

(U) FY 1991 Planned Program: Not Applicable.

(U) FY 1992 Planned Program:
- (U) Conduct tests and a system integration and demonstration of the Mobile Intrusion Detection and Assessment System (MIDAS), to include the Video Imaging System for Detection, Tracking and Assessment (VIDSTA).

Program Element: #0603714F Budget Activity: #4 - Tactical Programs
PE Title: DOD Physical Security Equipment - Exterior

(U) FY 1993 Planned Program:
- (U) Conduct a field demonstration/validation of the Mobile Intrusion Detection and Assessment System (MIDAS), to include the Video Imaging System for Detection, Tracking and Assessment (VIDSTA).

(U) Work Performed By: This project is managed by the Physical Security Systems Directorate, Electronic Systems Division, Hanscom AFB, MA. The Department of Energy/Sandia National Laboratory, Albuquerque, NM will perform development tasks, and either Analytical Systems Engineering Corp. or Horizons Technology, Inc. will assist with systems engineering support and integration tasks.

(U) Related Activities:
(U) Program Element 0604715F, DOD Physical Security Equipment - Ext.
(U) Program Element 0207588F, Air Base Ground Defense.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):

(U) Other Procurement (BA 03, P-1 127):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	-0-	-0-	650	533	5,451	6,634
Qty	Several items, various quantities.					

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603723F Budget Activity: 2-Advanced Technology Development
PE Title: Civil & Environmental Engineering Technology

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2103 Environmental Quality Technology	1,267	2,380	2,236	2,156	Cont	TBD
2104 Civil Engineering Technology	4,754	6,799	7,400	7,179	Cont	TBD
3037 Noise & Sonic Boom Impact Technology	1,899	2,338	2,400	2,350	Cont	TBD
Total	7,920	11,517	12,036	11,685	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program supports advanced technology developments to (1) enhance an air base's ability to survive and recover from an enemy chemical/biological or conventional attack; (2) solve Air Force-unique environmental problems in order to comply with state/national/international law and allow the Air Force to maintain readiness, conduct realistic combat training, and deploy new weapon systems; and (3) apply cost-effective advances in civil engineering technologies to air base operations. The Environmental Quality Technology goals are 50 percent reduction in generation of selected hazardous waste resulting in $13M per year savings in Air Force operations and maintenance costs; cost-effective control technology for industrial emissions from aircraft painting operations resulting in a $6M savings annually; and 95% faster emergency downwind hazard corridor prediction for disaster response. The Civil Engineering Technology goals are wartime survivability of mission critical air base facilities and utilities; air base battle damage assessment in minutes instead of hours; rapid repair of essential air base facilities, utilities, and aircraft operating surfaces; and 100% improvement in post-attack fire suppression and crash rescue. The Noise Sonic Boom Impact Technology goal is rapid environmental impact assessment for Air Force flying operations.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

1. (U) Project 2103, Environmental Quality Technology: This project develops advanced technologies and validates systems to solve environmental restoration problems, reduce hazardous emissions from weapon systems, minimize AF industrial waste, and eliminate toxic pollutant releases from Air Force operations.

(U) FY 1990 Accomplishments:
- (U) Developed nontoxic metal strippers to eliminate hazardous waste from electroplating operations.
- (U) Developed innovative electroplating processes to eliminate hazardous wastes.

(U) FY 1991 Planned Program:
- (U) Develop methods to reduce toxic waste generated by chromium electroplating of aircraft parts.

Program Element: #0603723F Budget Activity: 2-Advanced Technology Development
PE Title: Civil & Environmental Engineering Technology

- (U) Evaluate ways to reduce hazardous waste from depleted uranium munitions tests.
- (U) Demonstrate cone penetrometer technology for site remediation.

(U) FY 1992 Planned Program:
- (U) Develop recycling technology to recover metals from sludges.
- (U) Develop in-process system for treating and recycling electroplating bath solutions.
- (U) Demonstrate alternative processes to electroplating.

(U) FY 1993 Planned Program:
- (U) Demonstrate alternative paint stripping techniques to eliminate waste.
- (U) Demonstrate supercritical fluid oxidation of rocket propellants.

(U) Work Performed By: AF Engineering and Services Lab, Tyndall AFB FL manages the program. Contractors are: EG&G, Idaho Falls ID; Technology Management Systems Inc., Burlington MA; ACUREX, Mountain View CA; Martin Marietta, Denver CO; and ASI, Albuquerque NM.

(U) Related Activities:
(U) PE #0602102F, Materials.
(U) PE #0602202F, Human Systems Technology.
(U) PE #0602203F, Aerospace Propulsion.
(U) PE #0602206F, Civil Engineering and Environmental Quality.
(U) PE #0603211F, Aerospace Structures.
(U) PE #0604708F, Other Operational Equipment.
(U) No unnecessary duplication of effort within the USAF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2104, Civil Engineering Technology: This project develops advanced technologies and validates systems to build air base facilities and utilities that can survive chemical/biological and conventional weapons attack; construct and repair runways and air mobile structures; perform air base battle damage assessment and repair; perform crash rescue and suppression of aircraft and air base post-attack fires; and perform critical peacetime civil engineering construction, maintenance and repair.

(U) FY 1990 Accomplishments:
- (U) Developed battle damage assessment and repair technology for recovery of critical structures.
- (U) Developed designs for an anti-penetration layered system to protect hardened facilities from point penetrating weapons.
- (U) Developed environmentally safe, nontoxic firefighting agents.

(U) FY 1991 Planned Program:
- (U) Demonstrate method to reduce bomb crater upheaval and decrease repair time for large craters.
- (U) Demonstrate reinforced earth construction techniques for hardened air base facilities.

Program Element: #0603723F Budget Activity: 2-Advanced Technology Development
PE Title: Civil & Environmental Engineering Technology

- (U) Identify the response of air base structures to enhanced blast weapons.

(U) FY 1992 Planned Program:
- (U) Develop designs for hardened airmobile personnel shelters.
- (U) Develop transattack fire damage assessment system for detection and assessment.
- (U) Develop design concept for modular hardened shelters.

(U) FY 1993 Planned Program:
- (U) Demonstrate rapid repair of small craters.
- (U) Validate environmentally safe halon alternative agent.

(U) Work Performed By: Air Force Engineering and Services Lab, Tyndall AFB FL manages the program. Contractors: Applied Research Associates, Albuquerque NM; New Mexico Engineering Research Institute, Albuquerque NM; University of North Carolina, Raleigh NC; ODETICS, Anaheim CA; and EG&G, Idaho Falls ID.

(U) Related Activities:
(U) PE #0602102F, Materials.
(U) PE #0602202F, Human Systems Technology.
(U) PE #0602206F, Civil Engineering and Environmental Quality.
(U) PE #0603231F, Crew Systems and Personnel Protection.
(U) PE #0603307F, Air Base Operability Advanced Development.
(U) PE #0604617F, Air Base Operability.
(U) PE #0604703F, Aeromed/Chem Defense Systems Development.
(U) PE #0604708F, Other Operational Equipment.
(U) No unnecessary duplication of effort within the USAF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3037, Noise and Sonic Boom Impact Technology: This project develops an assessment and prediction capability to evaluate impact of noise from subsonic and supersonic aircraft operations. As directed by the National Environmental Policy Act, the Air Force must assess the environmental impacts of flying operations. Today, this takes two to five years to complete. Improving this capability is essential to respond to public concerns in a responsible and timely manner, prepare accurate environmental impact statements, and reduce the effects of aircraft noise. The Air Force is the lead DOD agency for noise and sonic boom research.

(U) FY 1990 Accomplishments:
- (U) Developed Assessment System for Aircraft Noise (ASAN) model and demonstrated capability with experts from SAC, TAC and the National Guard Bureau; incorporated two models on noise effects prediction for animals.
- (U) Determined the criteria of effects of seismic waves from sonic booms on buildings and structures.

(U) FY 1991 Planned Program:
- (U) Integrate test results to update "beta" ASAN version.

Program Element: #0603723F Budget Activity: 2-Advanced Technology Development
PE Title: Civil & Environmental Engineering Technology

- (U) Initiate plans for field testing with major commands.
- (U) Develop a cumulative damage prediction model for structural effects resulting from aircraft sonic booms.
- (U) Develop human annoyance prediction models resulting from low altitude aircraft overflights.

(U) FY 1992 Planned Program:
- (U) Demonstrate ASAN model with the major commands.
- (U) Develop on-line tutorial for ASAN users and input databases for developing environmental impact statements.

(U) FY 1993 Planned Program:
- (U) Complete ASAN transition with the major commands and continue development of on-line tutorial.
- (U) Incorporate ASAN databases and prediction models for structures, animals, and human annoyance.
- (U) Initiate validation of noise effects prediction models and develop land use compatibility guidelines.

(U) Work Performed by: Armstrong Laboratory, Brooks AFB TX manages the program. Prime contractor is BB&N, Canoga Park CA.

(U) Related Activities:
(U) PE #0602202F, Human Systems Technology.
(U) PE #0602203F, Aerospace Propulsion.
(U) PE #0602206F, Civil Engineering and Environmental Quality.
(U) No unnecessary duplication of effort within the USAF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603726F
PE Title: C3I Subsystem Integration

Budget Activity: #2-Advanced Technology Development

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2810 Advanced Cartographic Applications	1,014	1,660	1,712	1,760	Cont	TBD
2863 Integrated Photonics	4,142	4,860	5,150	5,430	Cont	TBD
3192 Tactical Optical Disk Systems (TODS)	2,090	2,583	2,621	2,820	Cont	TBD
Total	7,246	9,103	9,483	10,010	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program develops and demonstrates C3I technologies in digital cartographic databases for mission planning, navigation, targeting, and weapons delivery; photonics technology to replace electronic technology in tactical and strategic systems; optical disk storage and processing of digital information for operations, intelligence and reconnaissance.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10M IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2810, Advanced Cartographic Applications: This project is the single Air Force program to develop, demonstrate and transition techniques and software to meet all weapon system requirements for digital cartographic (terrain, threat, and feature mapping) data. This data is used for mission planning, navigation, targeting, terrain analysis, and related intelligence functions. This project provides generic, standard applications software for Air Force exploitation of Defense Mapping Agency (DMA) cartographic data products. Project milestones, demonstrations and transitions are directly responsive to validated requirements of Air Force users and system developers.

(U) FY 1990 Accomplishments:
- (U) Transitioned digital cartographic applications software to Electronic Security Command and Foreign Technology Division for analysis of electronic signal intelligence.
- (U) Transitioned software for application of cartographic data to unit-level flight planning for TAC use in Desert Storm.

(U) FY 1991 Planned Program:
- (U) Begin development of unit-level intelligence cartographic software for demonstration in the Sentinel Byte testbed.
- (U) Demonstrate fully transportable software to generate sensor and threat displays for intelligence and mission planning.
- (U) Initiate development of software to interface digital cartographic database into the SAC Intelligence Network.
- (U) Demonstrate expert systems and neural networks as tools to improve responsiveness and utility of cartographic databases.

Program Element: #0603726F
PE Title: C3I Subsystem Integration

Budget Activity: #2-Advanced Technology Development

(U) FY 1992 Planned Program:
- (U) Demonstrate at HQ SAC the cartographic node/interface for the Relational Analysis of Internetted Linkages Subsystem (RAILS).
- (U) Demonstrate a unit-level intelligence cartographic capability for the Sentinel Byte worldwide intelligence network.
- (U) Initiate algorithm development to provide user options within standardized cartographic software applications.

(U) FY 1993 Planned Program:
- (U) Demonstrate at HQ SAC the database/software interface for distribution of host node cartographic data to all analyst agencies on the SAC Intelligence Network.
- (U) Initiate development of cartographic database automatic update and data reconciliation capability.
- (U) Demonstrate software to consolidate multiple cartographic applications and optimize speed, accuracy, and reliability.
- (U) Transition to TAC and SAC the cartographic software for DOD standardized image display for intelligence analysis.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB NY. The three contractors are PAR Technology, New Hartford NY; Grumman Data System, Woodbury NY; Digicomp Research, Ithaca NY.

(U) Related Activities:
(U) PE 0602702F, C3.
(U) PE 0603260F, Intelligence Advanced Development.
(U) There is no unnecessary duplication of effort within the AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2863, Integrated Photonics: Current electronic systems are susceptible to electromagnetic interference, electromagnetic pulse and radio frequency interference. Size constraints, speed and reliability also limit traditional electronic systems. Photonics based systems, that process information in the form of light (photonics) signals, will provide major improvements in tactical and strategic C3I systems by providing small size, high performance, high capacity, survivable alternatives to electronic based systems. This program demonstrates advanced hardware technology in optical signal processing, adaptive processing, optical control of phased arrays, integrated electro-optic networks, optical transmission, and nonlinear optical processing.

(U) FY 1990 Accomplishments:
- (U) Demonstrated a 2 to 500 MHZ, distortion-free analog fiber optic link for remoting Electronic Security Command monitoring antennas.
- (U) Demonstrated high density optical interconnects between device circuitboards using holography to increase signal speed and reduce both signal loss and electromagnetic emissions.

Program Element: #0603726F
PE Title: C3I Subsystem Integration

Budget Activity: #2-Advanced Technology Development

- (U) Designed a coherent optical transmission system to replace microwave waveguide, increasing distances from transmitter to antenna and allowing wider bandwidth and higher frequencies.
- (U) Initiated development of an optical time/phase shifter network and frequency synthesizer to increase performance in the Defense Satellite Communications System.

(U) FY 1991 Planned Program:
- (U) Demonstrate a coherent optical system to reduce loss, increasing sensitivity, in remoted signal intelligence monitoring antennas.
- (U) Demonstrate high speed (100 MBPS) Intrusion Detection Optical Communications for secure communication without encryption devices.
- (U) Demonstrate an optical frequency synthesizer, a critical component for optical control to improve performance of phased array antennas used in airborne surveillance and space communications.

(U) FY 1992 Planned Program:
- (U) Demonstrate a 1 GOPS Optical Signal Processor for secure, jam resistant radar and communications.
- (U) Demonstrate optical time/phase shifter networks to improve performance, efficiency and antijam for phased array antennas.
- (U) Demonstrate a distortion-free analog fiber optic link for antenna remoting at frequencies from 1 to 20 GHZ.
- (U) Initiate development of a secure 1 GBPS communication network.

(U) FY 1993 Planned Program:
- (U) Initiate development of an integrated optic control system for surveillance and communication phased array antennas.
- (U) Design a one trillion operations per second optical signal processor for automatic combat identification of ground and airborne targets using multispectral surveillance systems.
- (U) Continue development of a secure 1 GBPS intrusion detection optical network for survivable tactical communications.
- (U) Demonstrate a photonic signal processor for automatic signal identification in signal intelligence (SIGINT) collection.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB NY. Contractors are: Hughes Aircraft, Malibu CA; Westinghouse, Baltimore MD; Texas Instruments, Dallas TX; Martin Marietta, Baltimore MD; GTE, Waltham MA; Draper Labs, Cambridge MA.

(U) Related Activities:
(U) PE 0602702F, C3.
(U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
(U) PE 0603728F, Advanced Computer Technology.
(U) PE 0603789F, C3I Technology Development
(U) There is no unnecessary duplication of effort within the AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0603726F
PE Title: C3I Subsystem Integration

Budget Activity: #2-Advanced Technology Development

3. (U) Project 3192, Tactical Optical Disk Systems (TODS): Present C3I systems lack the data storage capacity and performance required for advanced operations and near-real-time sensor inputs. This project develops TODS, a family of erasable data optical storage systems with the high capacity/speed input/output needed. TODS includes a single 5.25-inch optical disk recorder/player, a single 14-inch optical disk recorder/player, and a ten-disk automated jukebox. The 5.25-inch TODS is for fighter aircraft for airborne access to mission-oriented data and the digital terrain system. The 14-inch TODS is for on-board sensor data storage in electronic surveillance aircraft. The jukebox will provide mass storage at intelligence centers, TR-1 reconnaissance aircraft ground stations, and SAC deployable C2 centers.

(U) FY 1990 Accomplishments:
- (U) Demonstrated critical components for read/write/erase capability for the 14-inch optical disk system.
- (U) Demonstrated TODS effectiveness in flight planning and control for close air support during the AFTI/F-16 demonstration.
- (U) Transitioned 5.25-inch TODS to the F-16 program office for full scale development and integration into the aircraft.

(U) FY 1991 Planned Program:
- (U) Complete detailed design for the 14-inch TODS system.
- (U) Evaluate in the laboratory the performance of the erasable storage media for the 14-inch TODS.
- (U) Conduct lifecycle testing on read/write/erase components.

(U) FY 1992 Planned Program:
- (U) Complete fabrication and assembly of the 14-inch TODS.
- (U) Initiate flight test of 14-inch TODS on RC-135 aircraft.
- (U) Design the optical jukebox for SAC intelligence centers.

(U) FY 1993 Planned Program:
- (U) Complete integration and flight demonstration of 14-inch TODS for airborne electronic intelligence (ELINT) recording.
- (U) Conduct 14-inch TODS user training and transition to the RC-135 program office in AFLC.
- (U) Assemble and test operation of jukebox storing ten (10), double-sided, 14-inch disks.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB NY. The two contractors are Sundstrand Data Control, Remond WA; General Electric, Camden NJ.

(U) Related Activities:
(U) PE 0602702F, C3.
(U) There is no unnecessary duplication of effort within the AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603728F Budget Activity: #2 - Advanced Technology Development
PE Title: Advanced Computer Technology

A. (U) RESOURCES ($ In Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2527 Software Life Cycle Tools	2,216	2,854	3,380	3,900	Cont	TBD
2530 Distributed Systems Reliability and Survivability	2,680	2,847	2,900	2,695	Cont	TBD
2532 Knowledge-based Systems	2,464	3,043	3,577	4,143	Cont	TBD
Total	7,360	8,744	9,857	10,738	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program develops and demonstrates technologies that control cost, reduce risk, and increase efficiency and effectiveness of software and computers required in combat systems (mission critical). The basic thrusts of the projects in this program element are: (1) to evaluate and transition new software engineering technology to improve the quality throughout software's life cycle in Air Force Mission Critical Software Systems; (2) to improve survivability of land, air, and space-based dispersed command and control systems and (3) to develop computer systems which automate the human thought problem solving process. These will improve effectiveness of the following: weapons system maintenance and logistics planning, strategic and tactical decision support systems, weapons system maintenance, resource allocation, situation assessment, and intelligence analysis. This program currently has highly visible and user supported technology transition opportunities in each project. Examples of the technology transition opportunities are as follows: project 2527, software engineering for Air Force Logistics Command; project 2530, survivable distributed computing for HQ SAC and the Joint Strategic Target Planning Staff; and project 2532, AI-based mission planning for US Transportation Command. Increased FY92/93 funding reflects major milestones for these transition opportunities.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) 2527, Software Life Cycle Tools: The increased use of digital computers has raised the cost of software exponentially and current software generation capabilities are inadequate to meet the demand for improved cheaper software. The objective of this project is to provide tools which can reduce the life cycle costs of Air Force Mission Critical Software Systems. The project develops software/system life cycle environments for software quality measurement and assessment, requirements engineering to reduce system errors, and innovative software engineering technology for high performance computers. The outputs of this project will enable Air Force personnel to effectively manage the cost of software acquisition and maintenance.

Program Element: #0603728F Budget Activity: #2 - Advanced Technology Development
PE Title: Advanced Computer Technology

(U) FY 1990 Accomplishments:
- (U) Developed Expert System for Specifying Quality Software, provides powerful tool for acquisition managers.
- (U) Tested and delivered Software Life Cycle Support Environment to three Air Logistics Centers, with AFLC implementation in FY 1991.

(U) FY 1991 Planned Program:
- (U) Integrate Rome Lab Software Quality Framework, Software Engineering Institute (SEI) Process Metrics and ESD/AFSC Management Indicators into a single model for use in acquisition programs.
- (U) Integrate Software Project Management System (SPMS) into Software Life Cycle Support environment (SLCSE) providing a powerful tool for system configuration control, baselining, reviews and audits.

(U) FY 1992 Planned Program:
- (U) Complete Requirements Engineering Environment (REE) to provide automated analysis for large system specification development.
- (U) Establish the Software Quality Laboratory for Air Force users to assess the benefit of software quality tools and techniques.

(U) FY 1993 Planned Program:
- (U) Extend SLCSE to include system engineering capabilities, system level functional decomposition, control of hardware, software and firmware, full documentation, impact analysis and on-line support for system/project management.
- (U) Initiate thrust in Advanced Testing and fault tolerance techniques to provide capabilities for high assurance software.

(U) Work Performed By: Rome Laboratory, Griffiss AFB NY manages this project. Contractors are: General Research Corporation, Santa Barbara CA; Software Productivity, Melbourne FL; Martin Marietta, Denver CO; Harris Corporation, Melbourne FL; and IITRI, Lanham MD.

(U) Related Activities:
(U) Program Element 0602702F, Command, Control and Communications
(U) Program Element 0604740F, Computer Resource Management
(U) Program Element 0701112F, Inventory Control Point Operation
(U) There is no unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable

(U) International Cooperative Agreements: Data Exchange Agreement (DEA) between US and Australia on "Software Engineering for Embedded Computer Systems."

2. Project 2530, Distributed Systems Reliability and Survivability: The project develops data processing and Distributed Operating System (DOS) technology to provide interoperability among command centers which are dispersed for survivability. This is vital to survival of physically dispersed command centers.

Program Element: #0603728F Budget Activity: #2 - Advanced Technology Development
PE Title: Advanced Computer Technology

(U) FY 1990 Accomplishments:
- (U) Completed initial phase of US/Australian Distributed Systems Experiment to explore distributed tactical applications.
- (U) Built Survivable Adaptive Planning Experiment (SAPE) testbed to exploit distributed computing and AI for the SIOP planning process.

(U) FY 1991 Planned Program:
- (U) Establish dual cluster SIOP planning configuration to demonstrate ability to dynamically plan for moveable targets.
- (U) Evaluate real time distributed operating system in a distributed system environment for C^3I and avionics survivability.

(U) FY 1992 Planned Program:
- (U) Demonstrate SIOP planning for up to 1000 sorties per day and several hundred weapons and targets.
- (U) Continue evaluation of real time distributed operating system to improve survivability.

(U) FY 1993 Planned Program:
- (U) Add a multi-media communications system to SAPE testbed to demonstrate survivability.
- (U) Continue trans-attack version of SAPE.

(U) Work Performed By: Rome Laboratory, Griffiss AFB NY manages this project. McDonnell Douglas, Sunnyvale CA; Bolt, Beranek & Newman, Cambridge MA.

(U) Related Activities:
(U) Program Element 0602702F, Command, Control and Communications
(U) Program Element 0604740F, Computer Resource Management
(U) Program Element 0701112F, Inventory Control Point Operation
(U) There is no unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable

(U) International Cooperative Agreements: Agreement between Rome Lab and the Australian Electronics Research Laboratory (ERL) to support cooperative development of networking and distributed systems technology.

3. Project 2532, Knowledge-Based Systems: The objective of this project is to apply knowledge-based computer systems technology to reduce costs for weapon system maintenance, logistics planning, tactical and strategic decision support systems, resource allocations, situation assessment and intelligence analyses. This project will develop knowledge-based computer systems which automate, demonstrate and validate cost-effective applications to diverse Air Force problems resulting in an order of magnitude reduction in software development and support activities.

Program Element: #0603728F Budget Activity: #2 - Advanced Technology Development
PE Title: Advanced Computer Technology

(U) FY 1990 Accomplishments:
- (U) Established core Artificial Intelligence (AI) based mission planning capability for crisis planning for USTRANSCOM.
- (U) Demonstrated Knowledge Based Software Assistant (KBSA) project management capability and delivered to AFLC.

(U) FY 1991 Planned Program:
- (U) Demonstrate AI technology and evaluation framework for development of large scale knowledge based systems for command and control.
- (U) Demonstrate a knowledge based "intelligent" assistant supporting all facets of software development to reduce time and cost.

(U) FY 1992 Planned Program:
- (U) Major new thrust will provide near real-time automation of mission planning for theater and global operations.
- (U) Demonstrate prototyping environment at USTRANSCOM, including AI based planning and scheduling tools, test data and operational prototypes for crisis planning.
- (U) Demonstrate benefits of AI for mission critical software in full life cycle of software development using air space management/air traffic controller models.
- (U) Demonstrate planning tools for rapidly evaluating alternatives for transportation planning.

(U) FY 1993 Planned Program:
- (U) Demonstrate testbed capability to handle a full scale AF tactical C^2I application based on AI technology.
- (U) Demonstrate knowledge based configuration management and Ada optimization capabilities for complex systems.

(U) Work Performed By: Rome Laboratory, Griffiss AFB NY manages this project. Primary contractors are Kestrel Development Corp., Palo Alto CA; Advanced Decision Systems, Mountain View CA; SAIC, San Diego CA; Syracuse University, Syracuse NY; and BBN Laboratories Inc, Cambridge MA.

(U) Related Activities:
(U) Program Element 0602702F, Command, Control and Communications
(U) Program Element 0604740F, Computer Resource Management
(U) Program Element 0701112F, Inventory Control Point Operation
(U) There is no unnecessary duplication of effort within AF or DOD.

(U) Other Appropriation Funds: Not Applicable

(U) International Cooperative Agreements: KBSA work is part of Defense Exchange Agreement described under Project 2527.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603742F Budget Activity: 4 - Tactical Programs
PE Title: Combat Identification Technologies

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2597, Noncooperative Identification Subsystems	1,545	1,608	23,496	19,616	Cont	TBD
3765, Joint-Service Noncooperative ID Technologies	400	400	400	400	Cont	TBD
Total	1,945	2,008	23,896	20,016	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element develops, demonstrates, and transitions promising new noncooperative target identification (NCTI) technologies to provide high confidence, long-range, all-weather, and jam-resistant identification (ID) of airborne targets in world-wide combat environments. These efforts are directed toward providing both direct and indirect NCTI capabilities, and are coordinated with the other services for joint development and applications.

and is the Tactical Air Forces' top priority combat ID requirement. This combat capability is required in order to use our

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 2597, Noncooperative Identification Subsystems: See attached format for detailed description and plans.

2. (U) Project 3765, Joint Service Noncooperative ID Techniques: Supports the Tri-Service Target Identification Program (TRI-TIP) which supports

(U) FY 1990 Accomplishments:
- (U) Investigated methods for collection of Supported Tri-Service Target Identification Program (TRI-TIP).

(U) FY 1991 Planned Program:
- (U) Investigate improved ntinue support of Tri-Service Target Identification Program (TRI-TIP).

(U) FY 1992 Planned Program:
- (U) Continue support of TRI-TIP.

Program Element: 0603742F Budget Activity: 4 - Tactical Programs
PE Title: Combat Identification Technologies

(U) FY 1993 Planned Program:
- (U) Continue investigation of [redacted]

(U) Work Performed by: The U.S. Navy is the lead service for TRI-TIP. USAF points of contact include the Air Force Wright Laboratory, Wright-Patterson AFB, OH; and Rome Laboratory, Griffiss AFB, NY.

(U) RELATED ACTIVITIES:
- (U) PE #0604725F, Combat Identification Systems.
- (U) PE #0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE #0603789F, C3I Technology Development.
- (U) PE #0602204F, Aerospace Avionics.
- (U) PE #0602702F, Command, Control, Communications.
- (U) All cooperative and noncooperative ID programs are reviewed by the Tri-Service General Officer's Steering Committee for Combat ID (GOSC-CI) ensuring there is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) OTHER APPROPRIATION FUNDS: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: 0603742F Project Number: 2597
PE Title: Combat Identification Technologies Budget Activity: 4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Noncooperative Identification Subsystems	1,545	1,608	23,496	19,616	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The U.S. Tactical Air Forces have a

As a result, stringent operational requirements are imposed:

..., and transitions promising new noncooperative target identification (NCTI) technologies to meet these stringent requirements. These efforts reflect the Air Force's increased emphasis and priority on noncooperative identification.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) A comprehensive ID analysis selected technologies and developed plans to transition/accelerate selected NCTI technologies.
   - (U)
   - (U) Man-in-the-loop simulations tested algorithms developed in the Attribute Fusion for ID program.
   - (U) Planning done to incorporate
   - (U) Investigated

2. (U) FY 1991 Planned Program:
   - (U) Make preparations to execute increased Air Force emphasis, starting in FY92, on accelerating/transitioning NCTI technologies. Have Lion and Have Centaur contract awards in FY91 enable full execution at the start of FY 92.
   - (U) Have Centaur Phase I begins.

Program Element: 0603742F Project Number: 2597
PE Title: Combat Identification Technologies Budget Activity: 4 - Tactical Programs

- (U) Have Lion Phase I begins.
- (U) Initiate study to investigate feasibility of integrating the into the Ground Tactical Air Control System.
- (U) Investigate incorporating
- (U) Perform preliminary test runs at the TACCSF. Modify TACCSF and define test plan.
- (U) Begin NCTI/Integrated Avionics study.
- (U) Begin NCTI/ALR-56 feasibility study.

3. (U) FY 1992 Planned Program:
- (U) Execute Air Force plans to increase emphasis and priority on NCTI. The planned efforts are IAW Defense Science Board recommendations. Have Lion/Have Centaur contract awards in 2Q FY 91 enable full execution at the start of FY 92.
- (U) Have Centaur Phase I ends with Preliminary Design Review. Decision to proceed with Phase II to start detailed hardware and software design and test planning.
- (U) Have Lion Phase I ends with Preliminary Design Review. Decision to proceed with Phase II to start detailed hardware and software design and test planning.
- (U) Demonstrate
- (U) Collect
- (U) Have Dance flight demonstration of
- (U) begins.
- (U) Upgrade Computer Aided Electronic Warfare Information System (CAEWIS) to support emitter identification data bases for operational aircraft.
- (U) Perform applications studies and demonstrations of
- (U) Perform man-in-the-loop NCTI simulations at TACCSF.
- (U) Complete NCTI/Integrated Avionics study.
- (U) Complete NCTI/ALR-56 feasibility study.

4. (U) FY 1993 Planned Program:
- (U) Have Centaur Critical Design Review. Decision point to proceed with hardware/software modifications, integration, and testing.
- (U) Have Lion Critical Design Review. Decision point to proceed with hardware/software modifications, integration, and testing.
- (U) asibility demonstration is complete and specifications for modification of the AN/TPS-75 will be delivered, along with program planning for a full scale development program.
- (U) Perform applications studies and demonstrations of
- (U) Perform multi-sensor correlation/integration study.
- (U) Procure NCTI Ground-to-Air Measurement System (GTAMS).
- (U) Procure ARTIS NCTI processors.

Program Element: 0603742F Project Number: 2597
PE Title: Combat Identification Technologies Budget Activity: 4 - Tactical Programs

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

D. (U) Work Performed by: The work is managed by the Air Force Wright Laboratory, Wright-Patterson AFB, OH; and by Rome Laboratory, Griffiss AFB, NY. Contractors include: Hughes Aircraft, Los Angeles, CA; Westinghouse, Baltimore, MD; Northrop, Los Angeles, CA; Veda, Inc., Dayton, OH.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Reflects increased Air Force emphasis, priority, and commitment to NCTI. Transitions UHRR, IRF, for F-15, F-16, ATF, and
2. (U) SCHEDULE CHANGES: Reflects increased Air Force emphasis, priority, and commitment to NCTI.
3. (U) COST CHANGES: Reflects increased Air Force emphasis, priority, and commitment to NCTI. The Air Force increased funding in order to accelerate transition of NCTI techniques to operational status.

F. (U) PROGRAM DOCUMENTATION:
- (U) TAF SON 304-79, Air-to-Air Target Identification, 30 Jun 79.
- (U) TAF SON 305-79, Surface-to-Air Target Identification, 30 Jun 79.
- (U) TAF SON 304-83, Advanced Tactical Fighter/Air-to-Air, 9 Nov 84.
- (U) TAF SON 320-82, Advanced Tactical Surveillance System, 15 May 86.
- (U) Joint Mission Element Need Statement (JMENS) for Improved Identification Capability, 30 Sep 80.

G. (U) RELATED ACTIVITIES:
- (U) PE #0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE #0603789F, C3I Technology Development.
- (U) All programs are reviewed by the Tri-Service General Officers Steering Committee for Combat ID to ensure there is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

I. (U) International Cooperative Agreements: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1.	Have Centaur PDR	2Q FY 92
	CDR	1Q FY 93
	Flight test	2Q FY 94
2.	Have Lion PDR	4Q FY 92
	CDR	3Q FY 93
	Flight test	2Q FY 95
3.	Have Dance flight demo	2Q FY 92
4.	NCTI/Integrated Avionics study start	4Q FY 91
5.	NCTI/RWR study start	3Q FY 91
6.	TPS-75/ALQ-128 integration study start	3Q FY 91

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603789F
PE Title: C3I Technology Development

Budget Activity: #2-Advanced Technology Development

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2333 Surveillance Radar Technology	2,776	2,581	2,340	2,442	Cont	TBD
2335 Survivable Communications Technology	1,909	2,575	3,085	2,933	Cont	TBD
3433 Laser Communications	3,806	4,123	3,774	3,622	Cont	TBD
4072 Indirect Non-Cooperative Target Identification (NCTI) Adv Development	0	0	436	711	Cont	TBD
Total	8,491	9,279	9,635	9,708	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This advanced technology development program demonstrates and validates ground, air and space based command, control, communications and intelligence (C3I) technology required to maintain USAF capabilities in a fast paced, sophisticated, high threat and intense jamming environment. Beginning in FY 1992, Project 2333 is broken into two major elements: radar technology (remains in Project 2333) and indirect NCTI (Project 4072) for improved surveillance and battlefield C3I. This break is made to highlight the technology base contributing to the important target identification (ID) requirement. This program also develops advanced technology to provide tactical battle managers uninterrupted and reliable C3. Laser communications for satellite crosslinking techniques with secure anti-jam (A/J) and low probability of intercept (LPI) capabilities are being developed.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10M IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2333, Surveillance Radar Technology: Current Air Force tactical surveillance systems (E-3, TPS-43, TPS-75) are limited in their ability to detect, track, and positively identify multiple targets in today's electronic warfare environment. This project develops and demonstrates advanced antenna mainbeam nulling, adaptive electronic counter-countermeasure (ECCM) signal processing and conformal array technologies to restore low observable/stealth surveillance capabilities in jammed sectors. This project develops and integrates passive and active surveillance capabilities, including ID applications, to be deployed on C2 platforms such as the AWACS and Ground Tactical Air Control Systems (GTACS).

(U) FY 1990 Accomplishments:
- (U) Demonstrated, in live flights with multiple jammers, the deep radar mainbeam nulls required to detect targets in jamming.
- (U) Completed Critical Design Review (CDR) for the Conformal Array Radar Technology (CART) for next generation AWACS radar.
- (U) Fabricated/tested two monolithic microwave integrated circuit (MMIC) transmit/receive (T/R) modules for the CART array.

Program Element: #0603789F
PE Title: C3I Technology Development

Budget Activity: #2-Advanced Technology Development

- (U) Demonstrated adaptive signal processing for radar mainbeam control for effective counter-countermeasures against jamming.

(U) FY 1991 Planned Program:
- (U) Improve calibration and decrease computation time for increased mainbeam null depths to improve antijam for radar.
- (U) Complete fabrication of the 1024 element CART antenna array, except for integration of 256 T/R modules and patch radiators.

(U) FY 1992 Planned Program:
- (U) Install 256 T/R modules/patch radiators into the CART array.
- (U) Start test of 256 module CART array for ultra low sidelobes, time coherence of waveforms, jammer nulling, and real-time response.
- (U) Plan a ground test of 256 module CART array integrated with CART radar to validate signal processing, fusion and system capability.
- (U) Initiate study for integration of CART onto airborne test platform.
- (U) Begin procurement of 300 additional T/R modules for CART array.
- (U) Integrate mature sensors in surveillance laboratory to demonstrate near term enhanced tracking and identification (ID) capability.

(U) FY 1993 Planned Program:
- (U) Complete test of 256 module (quarter filled) CART array.
- (U) Complete ground test of integrated, quarter filled CART radar.
- (U) Complete CART integration study preparing for flight test.
- (U) Demonstrate integrated multiple sensor fusion techniques for increased probability and confidence in long range ID.

(U) Work Performed By: Rome Laboratory, Griffiss AFB NY manages this program. The three contractors are: Raytheon, Wayland MA; GE, Syracuse NY and SENSIS, Manlius NY.

(U) Related Activities:
(U) PE 0602204F, Aerospace Avionics.
(U) PE 0602702F, C3.
(U) PE 0603617F, C3 Applications.
(U) There is no unnecessary duplication of effort within the AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2335, Survivable Communications Technology: Dynamic, extremely hostile battlefield environments demand near instantaneous transmission and processing of vast amounts of C3I information for real-time decision making. Secure, survivable communications, interfaced to automated battle management decision support systems, are fundamental to that task. Yet, current communications and battle management subsystems have significant shortfalls. This project will increase C3I survivability and operational effectiveness by developing and integrating low probability of intercept, antijam (LPI/AJ) signal processing; multiband, multi-level secure communications; secured

Program Element: #0603789F
PE Title: C3I Technology Development

Budget Activity: #2-Advanced Technology Development

networks and battle management decision support capabilities for survivable, distributed C3I facilities.

(U) FY 1990 Accomplishments:
- (U) Completed development of Media Resource Controller (MRC) which manages multiple transmission media for alternate routing.
- (U) Applied new technologies, such as acoustic charge transport and enhanced programmable signal processor, to the tri-service mobile radio program, SPEAK EASY.
- (U) Developed interfaces between MRC, Integrated Line Of Sight (ILOS) radio and the low cost data relay radios.

(U) FY 1991 Planned Program:
- (U) Integrate MRC and Advanced Multimedia Information Distribution System (AMIDS) into the Tactical Battle Management (TBM) C3I test environment to demonstrate network survivability.
- (U) Continue development of SPEAK EASY key technologies.
- (U) Initiate development of a combat operations replanning capability to rapidly react to sudden situation changes, present options and implement selected courses of action.

(U) FY 1992 Planned Program:
- (U) Demonstrate MRC/AMIDS network survivability and enhanced communications preparing for transition to system development.
- (U) Initiate development of enhanced communications networks for improved Multi-Level Secure (MLS) and survivable networking.
- (U) Continue development/demonstration of SPEAK EASY key technologies.

(U) FY 1993 Planned Program:
- (U) Complete joint service (USAF/USA/USN) development of key technologies for the SPEAK EASY radio program.
- (U) Initiate the joint service advanced technology development of the SPEAK EASY interoperable multimode, multiband radio.
- (U) Transition MRC to system application development.
- (U) Complete Tactical Air Control Center (TACC) operations-intelligence system design and integrate MLS for real-time coordination of combat operations.

(U) Work Performed By: Rome Laboratory, Griffiss AFB NY manages this program. The four contractors are: Hughes Aircraft, Los Angeles CA; Georgia Tech Research Institute, Atlanta GA; Hazeltine, Long Island NY; Advanced Decision Systems (ADS), Mountain View CA.

(U) Related Activities:
(U) PE 0602702F, C3.
(U) PE 0603617F, C3 Applications.
(U) PE 0603737D, Balanced Technology Initiative (BTI).
(U) PE 0603006A, Command, Control, Communications Advanced Technology
(U) PE 0602232N, Command, Control, and Communications Technology
(U) There is no unnecessary duplication of effort within the AF or DOD.

Program Element: #0603789F
PE Title: C3I Technology Development

Budget Activity: #2-Advanced Technology Development

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3433, Laser Communications: The Air Force needs long range, very high data rate satellite communication links. Current technology cannot meet current Air Force requirements. This project is developing flight qualified hardware and a brassboard heterodyne laser communications system (LASERCOM) using frequency modulation which is more efficient than current pulsed-type systems. The system will ground demonstrate an inter-satellite data networking capability that can improve real-time global connectivity, reduce dependence on ground relay sites, increase coverage time for low orbit satellites, and enhance survivability by shared redundancy.

(U) FY 1990 Accomplishments:
- (U) Spaceflight qualified a 30 mW laser transmit/diagnostic module.
- (U) Finished testing a highly efficient optical heterodyne Frequency Shift Keying (FSK) demodulator.
- (U) Finished testing a brassboard system with CCD acquisition, heterodyne tracking, and acquisition/tracking handover.

(U) FY 1991 Planned Program:
- (U) Build-up high precision test environment for the LASERCOM satellite crosslink engineering model (EM).
- (U) Complete fabrication of the servomechanism, detector, control electronics, and software.
- (U) Begin integration and testing of subsystems for the EM including: the source select mechanism, the high-bandwidth steering mirror, and the point-ahead mechanism.

(U) FY 1992 Planned Program:
- (U) Finish fabrication/flight qualification of the EM optomechanical subsystem.
- (U) Complete development of the test environment for the EM.
- (U) Integrate and test all EM subsystems as available.
- (U) Hold industry and government Technology Transition Workshop.

(U) FY 1993 Planned Program:
- (U) Complete space qualification and integration of EM subsystems.
- (U) Begin testing the acquisition, tracking and communication systems of the integrated EM.
- (U) Provide design/technology baseline to future operational users and continue technology transition to government and industry.

(U) Worked Performed By: Phillips Laboratory, Kirtland AFB NM manages this program. The three contractors are: MIT-Lincoln Lab, Hanscom AFB MA; Optical Corp of America, Garden Grove CA; Electrofusion, Fremont CA.

(U) Related Activities:
(U) PE 0603250F, Lincoln Laboratory.

Program Element: #0603789F
PE Title: C3I Technology Development

Budget Activity: #2-Advanced Technology Development

(U) PE 0603223C, Systems Analysis and Battle Management.
(U) There is no unnecessary duplication of effort within the AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 4072, Indirect Non-Cooperative Target Identification (NCTI) Advanced Development: The Air Force must be able to positively identify hostile aircraft in combat to gain maximum advantage of beyond-visual-range (BVR) weapons and ensure a first-shot, first-kill capability. Indirect NCTI capabilities ensure long-range high-confidence identification (ID) to control the air battle and provide fighters with the necessary ID information to use BVR weapons. This project develops and integrates the necessary suite of complementary passive and active NCTI capabilities for C2 platforms such as AWACS and the Ground Tactical Air Control System (GTACS) Modular Control Equipment. This program complements fighter aircraft (direct) NCTI development in PE 63203F.

(U) FY 1990 Accomplishments: Not Applicable

(U) FY 1991 Planned Program: Not Applicable.

(U) FY 1992 Planned Program:
- (U) Define parameters and interfaces to incorporate state-of-the-art digital communications technology into the NCTI architecture.
- (U) Perform analysis to define parameters and interfaces to incorporate real-time intelligence into the NCTI architecture.

(U) FY 1993 Planned Program:
- (U) Integrate advanced NCTI techniques into NCTI testbed to demonstrate increase in probability and confidence of ID.
- (U) Integrate ID information from off-board sensors including real time intelligence, via digital communications into the NCTI testbed.

(U) Work Performed By: Rome Laboratory, Griffiss AFB NY manages this program. The three contractors are: TASC, Burlington MA; CALSPAN, Buffalo NY; and Mitre, Bedford MA.

(U) Related Activities:
(U) PE 0602702F, C3.
(U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
(U) PE 0603742F, Combat Identification Technology.
(U) There is no unnecessary duplication of effort within the AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604201F Budget Activity: #4-Tactical Programs
PE Title: Aircraft Avionics Equipment Development

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2257	Standard Avionics/Joint Services Review Committee (JSRC) Initiatives					
	2,625	2,785	2,260	2,573	Cont	TBD
2258	Standard Inertial Navigation Unit (INU)					
	510	3,000	3,800	5,200	10,000	44,406
2297	Embedded Computer Software Standardization (ECSS)					
	2,170	2,000	1,000	1,000	Cont	TBD
2560	High Order Language Control Facility (LCF)					
	400	400	500	500	Cont	TBD
2658	Avionics Architecture Implementation and Support (AAIS)					
	250	300	400	500	Cont	TBD
3264	Standard Flight Data Recorder (SFDR)					
	7,106	2,800	3,000	3,700	4,700	40,218
4017	Compass/Attitude & Heading Reference System (C/AHRS)					
	0	900	3,949	4,576	3,013	12,438
Total	13,061	12,185	14,909	18,049	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element explores and develops standard avionics architectures and equipment which will reduce acquisition and support costs, increase weapon system performance and availability, and foster technology evolution and insertion for operational force improvements. Reliability and Maintainability (R&M) play a major role in the identification of specific development efforts within this element as evidenced by the evolution of the Standard Inertial Navigation Unit, the Standard Central Air Data Computer, the Standard Flight Data Recorder and the Compass/Attitude & Heading Reference System. Joint avionics development efforts are pursued through participation in/support of the Joint Service Review Committee (JSRC) and as the DoD delegated Lead Standardization Activity for Avionics. Current JSRC initiatives include Standard Flight Data Recorder, Compass/Attitude & Heading Reference System and Solid State Barometric Altimeter. Development, enhancement and maintenance of MIL-STD-1750/1815 embedded computer software support tools are supported. Ongoing support activities, such as the High Order Language Control Facility and Avionics Architecture Implementation and Support program that both help ensure maintenance of credible software standardization.

Program Element: #0604201F Budget Activity: #4-Tactical Programs
PE Title: Aircraft Avionics Equipment Development

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2257, Standard Avionics and Joint Services Review Committee (JSRC) Initiatives:
Project identifies/develops candidate systems for standardization in Air Force; through JSRC, and as DoD Lead Service Activity (LSA) for Avionics, identifies/develops candidate systems for joint services standardization; maintains/updates the Air Force Avionics Roadmap, Avionics Planning Baseline and avionics database.

(U) FY 1990 Accomplishments:
- (U) Continued front-end work identifing avionics standardization opportunities through Air Force, JSRC and DoD LSA processes.
- (U) Continued support of JSRC initiatives.
- (U) Continued Modular Avionics Systems Architecture (MASA) Line Replaceable Module (LRM) FSD definition
- (U) Conducted LRM major retrofit study.
- (U) Evaluated Single Point Keying (SPK) for standardization.
- (U) Initiated Solid State Barometric Altimeter Program.
- (U) Maintained Air Force Avionics Roadmap and avionics baseline.
- (U) Evaluated development of family of standard power supplies.
- (U) Completed development of Standardization Evaluation Program (STEP) life cycle cost model acquisition front-end.

(U) FY 1991 Planned Program:
- (U) Continue front-end work to identify avionics standardization opportunities through Air Force, JSRC and DoD LSA processes.
- (U) Continue support of JSRC initiatives.
- (U) Evaluate MASA/LRM investigation and major retrofit study.
- (U) Continue development of SPK standard(s).
- (U) Initiate development of power supply standards.
- (U) Maintain Air Force Avionics Roadmap and avionics database.
- (U) Continue Solid State Barometric Altimeter development.
- (U) Implement/test Avionics Life Cycle Cost Estimating System (ALCCES) (Merges STEP with Avionics Acquisition Cost Estimating System (AACES)).
- (U) Initiate Common Weather Radar Program.
- (U) Initiate High Speed Data Bus (HSDB) certification program.

(U) FY 1992 Planned Program:
- (U) Continue front-end work to identify avionics standardization opportunities through Air Force, JSRC and DoD LSA processes.
- (U) Initiate MASA demonstration/validation program.
- (U) Initiate Low Probability of Intercept (LPI) radar altimeter program.
- (U) Maintain Air Force Avionics Roadmap and avionics baseline.
- (U) Continue Solid State Barometric Altimeter development.
- (U) Complete AACES development.
- (U) Continue HSDB certification & Common Weather Radar Program.

Program Element: #0604201F Budget Activity: #4-Tactical Programs
PE Title: Aircraft Avionics Equipment Development

(U) FY 1993 Planned Program:
- (U) Continue front-end work to identify avionics standardization opportunities through Air Force, JSRC and DoD LSA processes.
- (U) Continue MASA demonstration/validation program.
- (U) Continue LPI radar altimeter program.
- (U) Maintain Air Force Avionics Roadmap and avionics baseline.
- (U) Complete Solid State Barometric Altimeter development.
- (U) Complete AACES database development.
- (U) Continue HSDB certification & Common Weather Radar Program.

(U) Work Performed By: Major contractors are Draper Labs, Cambridge MA; ARINC, Annapolis MD; TASC, Fairborn OH; and Atlantic Research Corp, Fairborn OH. The Deputy for Avionics Control, Aeronautical Systems Division (Air Force Systems Command), Wright-Patterson AFB OH, provides program management.

(U) Related Activities:
- (U) PE #0603109F, INEWS/ICNIA.
- (U) PE #0603253F, Advanced Avionics Integration.
- (U) PE #0604609F, RAMTIP
- (U) PE #0708026F, PRAM
- (U) The Joint Service Review Committee (JSRC), under the Joint Logistics Commanders, coordinates similar efforts. PEs #64203N (US Navy) and 64201A (US Army) also support JSRC.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2258, Standard Inertial Navigation Unit (INU): Develops Air Force standard form,fit,function (F3) medium accuracy (0.8nm/hr) INU for A-7, C-130, F/RF-4, F-15, F-16, F/EF-111, MH-53J and Army OV-1; and precision accuracy (SPA) (0.2nm/hr) INUs for MC-130, AC-130 and Joint STARS. Applies ring laser gyro (RLG) technology in Air Force standard F3 medium accuracy INU. Major remaining effort is development of INU depot support equipment (SE). (SE development has been deferred due to funding cuts. These prior year cuts have required a "backward" ramp in funding the profile.)

(U) FY 1990 Accomplishments:
- (U) Began INU depot support equipment (SE) development planning and SE Requirements Document preparation.
- (U) Initiated INU PMRT plan for RLG INU.

(U) FY 1991 Planned Program:
- (U) Develop Standard F3 INU version for F-16A-D.
- (U) Initiate development of medium accuracy INU depot SE.
- (U) Initiate INU PMRT for both RLG and SPA INUs.

Program Element: #0604201F Budget Activity: #4-Tactical Programs
PE Title: Aircraft Avionics Equipment Development

(U) FY 1992 Planned Program:
- (U) Develop maintenance & test sets and software for RLG INU SE.
- (U) Begin development of SE for SPA INU.
- (U) Continue work on PMRT residual tasks.

(U) FY 1993 Planned Program:
- (U) Initiate Air Force acceptance testing for RLG INU depot SE.
- (U) Develop maintenance & test sets and software for SPA INU.
- (U) Continue work on precision accuracy INU SE development and PMRT residual tasks.

(U) Work Performed By: Major contractors are Honeywell, Clearwater FL, and Litton, Woodland Hills CA (medium accuracy RLG INU); and Kearfott, Little Falls NJ (precision accuracy INU). The Aeronautical Equipment System Program Office, Aeronautical Systems Division (Air Force Systems Command), Wright-Patterson AFB OH, provides program management.

(U) Related Activities:
- (U) PE #0701112F, Inventory Control Point Operations.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2297, Embedded Computer Software Standardization:
Maintain Embedded Computer Standardization Program Office; develop support software to implement standardization efforts such as MIL-STD-1815 (Ada Programming Language) and MIL-STD-1750A, (Air Force Standard 16 Bit Instruction Set Architecture Computer).

(U) FY 1990 Accomplishments:
- (U) Completed work on Ada/1750A production quality compiler to permit use of 1750A expanded memory option.
- (U) Initiated addition of symbolic debugger capability to Ada/1750A production quality compiler.
- (U) Determined necessary enhancements for Ada/1750A compiler.
- (U) Initiated program management responsibility transfer (PMRT) planning for production quality Ada/1750A compiler.
- (U) Established program to technically describe next generation avionics computer standardization policies.

(U) FY 1991 Planned Program:
- (U) Complete addition of symbolic debugger capability to Ada/1750A production quality compiler.
- (U) Initiate long-term support contract for Ada/1750A compiler.
- (U) Complete PMRT planning and negotiate PMRT date (FY 92).
- (U) Prepare program management plans and request for proposal for next generation, open architecture avionics computer.

Program Element: #0604201F Budget Activity: #4-Tactical Programs
PE Title: Aircraft Avionics Equipment Development

(U) FY 1992 Planned Program:
- (U) Establish sustaining engineering contract for Ada/1750A production quality compiler.
- (U) Execute PMRT plan for Ada/1750A production quality compiler.
- (U) Initiate first phase of next generation, open architecture avionics computer.

(U) FY 1993 Planned Program:
- (U) Continue residual PMRT tasks.
- (U) Establish software architectural requirements for next generation, open architecture avionics computer.

(U) Work Performed By: Major contractor is Boeing Military Airplane Company, Wichita KS (subcontracted to Intermetrics Inc, Cambridge MA). The Deputy for Avionics Control and Embedded Computer Standardization Program Office, Aeronautical Systems Division (Air Force Systems Command), Wright-Patterson AFB OH, provide program management.

(U) Related Activities:
- (U) PE #0602204F, Aerospace Avionics.
- (U) PE #0603226F, DoD Common Programming Language, Advanced Development.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 2560, High Order Language Control Facility (LCF): Control/maintain the JOVIAL J73 Language Standard (MIL-STD-1589C); validates JOVIAL compilers; provides language assistance, develops training tools and distributes JOVIAL information via a newsletter.

(U) FY 1990 Accomplishments:
- (U) Validated 3 JOVIAL compilers; published 4 newsletters.
- (U) Continued technical support to other AF organizations.
- (U) Completed JOVIAL Computer Based Training (CBT) Course.
- (U) Began development of JOVIAL/1750 CBT Course.

(U) FY 1991 Planned Program:
- (U) Validate 4 JOVIAL compilers; publish 4 newsletters.
- (U) Continue technical support to other AF organizations.
- (U) Complete development of JOVIAL/1750 CBT Course.

(U) FY 1992 Planned Program:
- (U) Validate JOVIAL and Ada compilers; publish 4 newsletters.
- (U) Continue technical support to other AF organizations.

Program Element: #0604201F Budget Activity: #4-Tactical Programs
PE Title: Aircraft Avionics Equipment Development

(U) FY 1993 Planned Program:
- (U) Validate JOVIAL and Ada compilers; publish 4 newsletters.
- (U) Continue technical support to other AF organizations.

(U) Work Performed By: The Computer Operations Directorate, Aeronautical Systems Division (Air Force Systems Command), Wright-Patterson AFB OH, provides program management.

(U) Related Activities: Not Applicable. There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 2658, Avionics Architecture Implementation and Support (AAIS): Support Systems Engineering Avionics Facility which provides and develops avionics architectural standards (e.g., MIL-STD-1553 and MIL-STD-1760); performs validation testing/engineering support for new/existing architectures; investigates/develops new standards.

(U) FY 1990 Accomplishments:
- (U) Performed MIL-STD-1553B testing for 6 subsystems.
- (U) Performed MIL-STD-1750 testing for 14 computers.
- (U) Continued support to NATO Standardization Agreement (STANAG) and Air Standardization Coordinating Committee (ASCC) standards development.
- (U) Updated MIL-STD-1750 Verification Software.
- (U) Began development of MIL-STD-1760 Handbook.
- (U) Began development of 32 bit computer architecture standard.

(U) FY 1991 Planned Program:
- (U) Perform MIL-STD-1553B testing for 5 subsystems.
- (U) Perform MIL-STD-1750 testing for 16 computers.
- (U) Continue MIL-HDBK-1760 development.
- (U) Continue 32 bit computer architecture standard development.
- (U) Develop High Speed Fiber Optic Data Bus (HSFODB) standard.

(U) FY 1992 Planned Program:
- (U) Perform MIL-STD-1553B testing for 5 subsystems.
- (U) Perform MIL-STD-1750 testing for 14 computers.
- (U) Complete MIL-HDBK-1760 development.
- (U) Continue 32 bit computer architecture standard development.
- (U) Perform initial High Speed Data Bus testing.
- (U) Define HSFODB test requirements.
- (U) Develop HSFODB simulation training device.
- (U) Support ANSI/MIL-STD-1815A, Ada Programming Language, and MIL-HDBK-1553, Rev B.
- (U) Coordinate and publish MIL-STD-1760B.
- (U) Support NATO STANAG and ASCC standard developments.

Program Element: #0604201F Budget Activity: #4-Tactical Programs
PE Title: Aircraft Avionics Equipment Development

(U) FY 1993 Planned Program:
- (U) Perform MIL-STD-1553B testing for 6 subsystems.
- (U) Perform MIL-STD-1750 testing for 12 computers.
- (U) Coordinate and publish MIL-HDBK-1760.
- (U) Continue support of 32 bit computer architecture standard.
- (U) Build High Speed Fiber Optic Data Bus test lab.
- (U) Develop hardware integration test bed.
- (U) Support ANSI/MIL-STD-1815A and MIL-HDBK-1553, Rev B.
- (U) Upgrade MIL-STD-1553 verification hot bench.
- (U) Support NATO STANAG and ASCC standard developments.

(U) Work Performed By: The Deputy for Avionics Control, Aeronautical Systems Division (Air Force Systems Command), Wright-Patterson AFB OH, provides program management.

(U) Related Activities:
- (U) PE #0603226F, DoD Common Programming Language, Advanced Development.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 3264, Standard Flight Data Recorder (SFDR): A Joint Service Review Committee-sponsored initiative to develop a standard crash survivable flight data recorder for various Air Force aircraft.

(U) FY 1990 Accomplishments:
- (U) Began E-3A, F-15E, KC-135, F-111 and B-52 SFDR development.
- (U) Flight tested trial integration units in simulator (C-17) and operational aircraft (F-16A/B ADF, C-130, C-141, T-38).
- (U) Began C-17 and F-16A/B SFDR production deliveries .
- (U) Qualified follower for production units.

(U) FY 1991 Planned Program:
- (U) Flight test trial integration units.
- (U) Begin T/OA-37 SFDR development.
- (U) Begin C-130 and C-141 SFDR production deliveries.
- (U) Begin SFDR depot support equipment development.

(U) FY 1992 Planned Program:
- (U) Flight test trial integration units on operational aircraft (E-3A, F-111, B-52, F-15A-E, T/OA-37).
- (U) Begin E-3A, F-111 and F-15E SFDR production deliveries.
- (U) Continue SFDR depot support equipment development.

(U) FY 1993 Planned Program:
- (U) Begin B-52 SFDR production deliveries.

Program Element: #0604201F Budget Activity: #4-Tactical Programs
PE Title: Aircraft Avionics Equipment Development

- (U) Complete development of SFDR depot support equipment.

(U) Work Performed By: Major contractor is Smiths Industries, Grand Rapids MI. The Aeronautical Equipment System Program Office, Aeronautical Systems Division (Air Force Systems Command), Wright-Patterson AFB OH, provides program management.

(U) Related Activities: Not Applicable. There is no unnecessary duplication of effort within the Air Force or the DoD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

7. (U) Project 4017, Compass/Attitude & Heading Reference System (C/AHRS): Joint Service Review Committee-supported program. Develops functional replacement systems for several existing compass systems and AHRSs for use in various Air Force and Navy aircraft. Tri-Service MOA includes Army for information.

(U) FY 1990 Accomplishments:
- (U) Prepared C/AHRS baseline document, acquisition plan, specification, Request for Information, and draft Request for Proposal (RFP).
- (U) Released draft RFP for industry review and comment.

(U) FY 1991 Planned Program:
- (U) Release RFP, receive proposals and do source selection.
- (U) Award C/AHRS development contract with production options.
- (U) Initiate development test and evaluation.

(U) FY 1992 Planned Program:
- (U) Design and develop prototype for weapon system integration and initial flight testing.
- (U) Evaluate integration study results and initial design for prime equipment and support equipment.

(U) FY 1993 Planned Program:
- (U) Complete C/AHRS development, test and integration.
- (U) Finalize user requirements for first production option.

(U) Work Performed By: The Aeronautical Equipment System Program Office, Aeronautical Systems Division (Air Force Systems Command), Wright-Patterson AFB OH, provides program management.

(U) Related Activities: Not Applicable. There is no unnecessary duplication of effort within the Air Force or the DoD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604211F Budget Activity: 6 - Defense-Wide Mission Support
PE Title: Advanced Aerial Targets Development

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2459, Target Payload Systems	3,231	4,608	6,421	6,298	Cont	TBD
3165, Full Scale Aerial Target Systems	0	6,500	18,900	17,200	Cont	TBD
Total	3,231	11,108	25,321	23,498	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Aerial Targets are essential to ensure air-to-air weapons effectiveness and mission proficiency of our tactical aircrews against enemy aircraft. The overall objective is to improve air-to-air weapon system accuracy and reliability by developing aerial target systems for Air Force weapon system test and evaluation. The Target Payload Systems task increases target effectiveness by improving subsystems for missile scoring and by developing subsystems which will provide target representative radar and IR signatures, as well as enhancing the survivability of the target.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

- (U) Project 2459, Target Payload Systems: Full-scale and subscale targets require payload subsystems for missile scoring, electronic and IR countermeasures, and radar and IR signature augmentation. Current scoring systems provide only miss distance information. The system under development provides missile path and position relative to the target at point of closest approach, which are essential to accurately calculate the probability of kill. Radar signature augmentation provides radar signatures for subscale targets representative of threat aircraft. IR signature augmentation on subscale targets provides a signature representative of threat military jet engines. Electronic and IR countermeasures (ECM & IRCM) include systems such as chaff and flare dispensers.

- (U) FY 1990 Accomplishments:
- (U) Start of Missile End-Game Scoring (MEGS) system development
- (U) IR survivability program for QF-106.
- (U) Threat assessment for air weapon electronic and infrared (IR) countermeasures techniques.

Program Element: #0604211F Budget Activity: 6 - Defense-Wide Mission Support
PE Title: Advanced Aerial Targets Development

- (U) FY 1991 Planned Program:
  -- (U) Completion of MEGS development.
  -- (U) Continue ECM threat assessment.
  -- (U) Begin IR countermeasures development for BQM-34.

- (U) FY 1992 Planned Program:
  -- (U) Develop ground control system interface for BQM-34.
  -- (U) Begin development of non-cooperative vector scoring.
  -- (U) Improve survivability of QF-106 target.

- (U) FY 1993 Planned Program:
  -- (U) Continue development of non-cooperative vector scoring.
  -- (U) Develop vector scoring capability for subscale targets.

- (U) Work Performed By: Northrop, Chicago, IL for the ECM payload systems and Motorola, Inc., Scottsdale, AZ for the MEGS.

- (U) Related Activities:
  -- (U) PE 0305116F Aerial Target Procurement.
  -- (U) Interservice coordination through Joint Logistics Commanders, Joint Technical Coordinating Group for Test & Evaluation.
  -- (U) Formal coordination through the Multi-Service Test Investments Review Committee ensures there is no unnecessary duplication of effort.

- (U) Other Appropriation Funds ($ in Thousands): Not Applicable.
  -- (U) Production funding is provided by host weapon system.

- (U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604211F
PE Title: Advanced Aerial Targets Development
Project Number: 3165
Budget Activity: 6 - Defense-Wide Mission Support

A. (U) RESOURCES: ($ in Thousands)

Full Scale Aerial Target Systems

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
QF-4	0	6,500	18,900	17,200	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
Aerial Targets are essential to ensure air-to-air weapons effectiveness and mission proficiency of our tactical aircrews against enemy aircraft. The overall objective is to improve air-to-air weapon system accuracy and reliability by developing aerial target systems for Air Force weapon system test and evaluation. In addition, full-scale targets (QF-100, QF-106) are used to support US Army air defense test and evaluation programs such as the Divisional Air Defense follow-on program, Stinger, Patriot and Improved Hawk. The targets being developed provide a cost effective mix of capabilities. Full-scale targets are fully representative of the threat, with realistic maneuvering performance, radar cross section and afterburning engine infrared (IR) signature. Subscale targets are a lower cost supplement used when threat simulation fidelity is not as critical. QF-4 development provides follow-on to the QF-106 full-scale target which will complete procurement in FY 1993.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments: Not Applicable.

2. (U) FY 1991 Planned Program:
   - (U) Award contract for QF-4 full-scale development
   - (U) Develop software for GFE drone control systems.

3. (U) FY 1992 Planned Program:
   - (U) Complete development through Critical Design Review.
   - (U) Begin contractor flight test.
   - (U) Cost estimate: Final, July 1990.
     -- (U) Extensive experience, off-the-shelf equipment.
     -- (U) Very high confidence based on previous programs.
     -- (U) Anticipated contract types:
        --- FSD, fixed-price incentive
        --- Production, firm fixed price with EPA clause

4. (U) FY 1993 Planned Program:
   - (U) Complete contractor flight test; begin DT&E/IOT&E.

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

Program Element: #0604211F
PE Title: Advanced Aerial Targets Development

Project Number: 3165
Budget Activity: 6 - Defense-Wide Mission Support

D. (U) Work Performed By: Honeywell, Inc., Sperry Defense Systems Division, Albuquerque, NM (Project 3165-QF-106).

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: No changes.

2. (U) SCHEDULE CHANGES: Program initiation delayed pending evaluation of potential joint program with Navy.

3. (U) COST CHANGES: Reduced FY91 budget due to Congressional cuts.

F. (U) PROGRAM DOCUMENTATION:
- (U) TAC SON 408-82, 24 May 84 (validated 16 Jan 85).

G. (U) RELATED ACTIVITIES:
- (U) PE 0305116F Aerial Target Procurement.
- (U) Interservice coordination through Joint Logistics Commanders, Joint Technical Coordinating Group for Test & Evaluation.
- (U) Formal coordination through the Multi-Service Test Investment Review Committee ensures there is no unnecessary duplication.

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

(U) Missile Procurement, BSA 4203 (Target Drones):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
WSC: M106QF (QF-106)						
Cost:	17,055	23,504	0	20,127		84,491
Qty:	48	48	0	44	N/A	188
WSC: M34ABQ (BQM-34)						
Cost:	506	22,900	28,833	44,238		
Qty(1):	1	55(2)	60	80(3)	Cont	TBD
WSC: M04AQF (QF-4)						
Cost:						
Qty:	0	0	0	0	Cont	TBD

NOTES: 1. Quantities based on latest contract price and include GFE.
2. Quantity may be reduced to fund BQM-34 ECP to upgrade the target for GRDCUS and fund GFE for engines.
3. Planned limited production for Competitive Target. BQM-34 buy will continue until Competitive Target satisfies IOT&E requirements and demonstrates its suitability.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1. Contract Award	4th Qtr FY 1991
2. Critical Design Review	4th Qtr FY 1992
3. DT&E/IOT&E Begins	4th Qtr FY 1993
4. First Production Delivery / IOC	4th Qtr FY 1995

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604212F Budget Activity: #4 - Tactical Programs
PE Title: Aircraft Equipment Development

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
1926 Aircraft Windshield Development	1,355	2,916	4,093	4,168	Cont	TBD
Total	1,355	2,916	4,093	4,168	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Develops, tests and evaluates subsystem equipment to satisfy operational needs for updating Air Force aircraft. Updates are required due to changing threats, equipment obsolescence and technical advancements, and to improve efficiency, effectiveness, and safety. This is the only full scale development (FSD) program element which employs advanced state-of-the-art technology to develop windshield systems with improved hazard resistance and reduced cost of ownership.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 1926, Aircraft Windshield Development: Applies the latest technology to improve high-speed birdstrike resistance of aircraft windshields, while maintaining high optical quality, durability, minimum weight and low life cycle cost. The threat of birdstrike is continuing to grow due to increasing emphasis on low-altitude, high-speed missions. Sand/dust erosion and other environmental factors are increasing the cost of ownership, especially for aircraft operating in Desert Shield.

(U) FY 1990 Accomplishments:
- (U) Flight evaluated B-1B extended life windshields up to one year.
- (U) Completed upgrade of transparency durability test facility.
- (U) Completed subscale testing of T-38 composite material frame.
- (U) Initiated durability testing of prototype F-111 windshields.
- (U) Initiated B-1B windshield dry seal development program.
- (U) Initiated F-111 improved windshield edge member design.

(U) FY 1991 Planned Program:
- (U) Evaluate waxes/polishes to improve optical quality of abraded windshields/canopies.
- (U) Develop transparency covers for heat, sand and chemicals.
- (U) Evaluate coatings for transparencies operating in the desert.
- (U) Complete durability testing and flight evaluation of B-1B extended life windshields.
- (U) Complete evaluation of technology for reducing cost-of-ownership for F-111 transparencies using dry seals and improved coatings.

Program Element: #0604212F Budget Activity: #4 - Tactical Programs
PE Title: Aircraft Equipment Development

- (U) Conduct birdstrike testing of T-38 windshield and composite material frame.
- (U) Fabricate F-16 prototype improved bird resistant canopy system.
- (U) Begin removal-for-cause criteria for aged transparencies.
- (U) Complete design review of F-15 alternative transparency.

(U) FY 1992 Planned Program:
- (U) Transition B-1B extended life windshields to operational use.
- (U) Flight evaluation of the T-38 windshield and composite frame.
- (U) OT&E of F-16 improved bird resistant canopy system.
- (U) Complete development of removal-for-cause criteria.
- (U) Begin FSD of F-16 advanced combat capability canopy.
- (U) Begin FSD of F-15 prototype alternative transparency system.
- (U) OT&E of B-1B windshields for the 1995-2000 missions.

(U) FY 1993 Planned Program:
- (U) Complete validation of F-16 improved bird resistant canopy and transition to operational use.
- (U) Transition T-38 bird resistant windshield and all-composite frame to operational use.
- (U) Perform OT&E on F-15 alternative transparency system.
- (U) Flight evaluate B-1B windshields to meet 1995-2000 mision needs.
- (U) Apply durability validation technologies for competitive reprocurement of the F-111 and F-16 transparancies.
- (U) Apply transparency service life tracking methodologies.

(U) Work Performed By: The contractors are Pittsburgh Plate Glass Co., Huntsville, AL; The University of Dayton Research Institute, Dayton, OH; and Technology Scientific Services, Inc., Dayton, OH. The program is managed at Aeronautical Systems Division, Wright-Patterson Air Force Base, OH.

(U) Related Activities:
- (U) Program Element 0602201F, Aerospace Flight Dynamics.
- (U) Program Element 0603203F, Advanced Avionics for Aircraft.
- (U) Program Element 0603211F, Aerospace Structural Materials.
- (U) Program Element 0604201F, Aircraft Avionics Equipment.
- (U) Program Element 0604226F, B-1B.
- (U) Program Element 0708026F, Productivity, Reliability, Availability and Maintainability.
- (U) There is no unnecessary duplication of effort in the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Data Exchange Agreements exist with the Federal Republic of Germany (AF-86-G-745) and Australia (AF-86-Aust-7010), entitled Birdstrike Resistant Aircraft Component Design, Development and Evaluation.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604218F
PE Title: Engine Model Derivative Program (EMDP)
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
No Project Number, Engine Model Derivative Program						
	444	514	1,022	1,043	Cont	TBD
Total	444	514	1,022	1,043	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: EMDP is an engineering development program that provides the latest engine technology advances to current weapon systems and provides a framework for engine development for future systems. EMDP contributes to system life extension, reduced life cycle cost, and enhanced performance. Enhanced performance is required to counter increases in system weight and increased threat capability. EMDP demonstrates derivative engine concepts incorporating advanced technology and components from government and contractor funded programs. EMDP demonstrates technology in performance, durability, operability, supportability, reliability, maintainability, and unique capabilities, such as thrust reversing and vectoring nozzles. These demonstrations are in prototype derivatives of existing engines prior to full scale development. Early demonstration of improved engine characteristics significantly reduces risk and shortens engine development and qualification, allowing quick, cost-effective response to weapon system needs. EMDP also evaluates candidate engines (commercial or military) to provide competitive engine opportunities. EMDP ensures the Air Force has propulsion alternatives to meet near- and far-term needs.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN FY 1992 AND FY 1993:

1. (U) No Project Number, Engine Model Derivative Program:

(U) FY 1990 Accomplishments:
- (U) Completed Controls and Accessories (C&A) evaluation program.
- (U) Completed axisymmetric vectoring nozzle conceptual design.
- (U) Completed SOF C-130 re-engining life cycle cost study.
- (U) Initiated Increased Capability Engine (ICE) conceptual design including thrust growth, axisymmetric vectoring nozzle, advanced C&A, and low observables capability for tactical aircraft.
- (U) Examined candidates and system needs in enhanced performance, operability, supportability, survivability, durability, reliability, maintainability, lower life cycle cost, competition.
- (U) Analyzed current engines for future derivative potential and developed a roadmap to meet Major Command (MAJCOM) requirements.

Program Element: #0604218F
PE Title: Engine Model Derivative Program (EMDP)

Budget Activity: #4 - Tactical Programs

(U) FY 1991 Planned Program:
- (U) Continue ICE conceptual design effort.
- (U) Continue examination of engine candidates and system needs.
- (U) Continue to analyze current engines for future derivative potential and develop a roadmap to meet MAJCOM requirements.

(U) FY 1992 Planned Program:
- (U) Continue ICE design effort.
- (U) Continue examination of engine candidates and system needs.
- (U) Continue to analyze current engines for future derivative potential and develop a roadmap to meet MAJCOM requirements.

(U) FY 1993 Planned Program:
- (U) Complete the ICE design effort.
- (U) Initiate effort to support contractor demonstrations of axisymmetric vectoring nozzles, low observables technology, advanced controls and accessories, and thrust growth for ICE.
- (U) Continue examination of engine candidates and system needs.
- (U) Continue to analyze current engines for future derivative potential and develop a roadmap to meet MAJCOM requirements.

(U) Program to Completion:
- (U) Continue to examine engine candidates and system needs to provide propulsion alternatives for near- and far-term needs.

(U) Work Performed By: EMDP is managed by the Propulsion System Program Office (SPO) at Aeronautical Systems Division, Wright-Patterson AFB OH. The contractors (and engines) involved are: Pratt & Whitney (P&W), West Palm Beach FL (F100, F117); General Electric Company (GE), Evendale OH (F110); Williams International, Walled Lake MI (FJ44, F107, F112, F121, T8300); Allison, Indianapolis IN (Model 150, 250 propfan, T56); Teledyne CAE, Toledo OH (235 propfan, Model 382-12, J69); and Garrett Corporation, Phoenix AZ (ETJ1081, F124/F125).

(U) Related Activities:
- (U) PE #0603216F, (Advanced Turbine Engine Gas Generator)
- (U) PE #0603202F, (Aircraft Propulsion Subsystem Integration)
- (U) PE #0602203F, (Aerospace Propulsion)
- (U) PE #0708011F, (Industrial Preparedness Program)
- (U) Activities conducted by the Army, the Navy, National Aeronautics and Space Administration, and propulsion industry Independent Research and Development (IR&D)
- (U) PE #0604268F, (Aircraft Engine Component Improvement Program) complements EMDP by addressing engine safety problems, service-revealed deficiencies, and improved reliability
- (U) The Air Force and the Navy have a broad memorandum of understanding for joint cooperative propulsion programs in areas of common interest
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604222F
PE Title: Nuclear Weapons Support

Budget Activity: #6 Defense Wide Mission Support

A. (U) RESOURCES ($ in thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY1993 Estimate	To Complete	Total Program
5708 Nuclear Weapons Support	2,209	2,279	5,841	5,653	Cont.	TBD

NOTE: The increase in funding for FY 1992 and beyond represents a transfer of funds from PE 0602601F to cover civilian salaries for ASD(ENN).

B. (U) BRIEF DESCRIPTION OF ELEMENT: Provides funds for contract efforts, travel, supplies and equipment, and salaries of the Aeronautical Systems Division, Directorate of Nuclear Systems Engineering (ASD/ENN) civilian nuclear weapon pecialists who are the Air Force center of expertise for nuclear weapon systems and provide technical guidance to the Department of Energy (DOE) and direction to the North Atlantic Treaty Organization for fulfillment of Air Force (AF) responsibilities related to development and support of nuclear weapon systems. (NOTE: ASD/ENN was formerly the Weapons Laboratory (WL) Nuclear Systems Surety Division (NTS).) Includes funds to demonstrate weapon/warhead compatibility to delivery platforms. Supports Strategic Air Command (SAC) Required Operational Capability 16-71 Peacekeeper), 12-76 (Air Launched Cruise Missile (ALCM)), 6-76 (B61 Strategic Bomb), 6-69 (B83 Modern Strategic Bomb), 15-83 (Short Range Attack Missile II (SRAM II)), 1-83 (Small Single Reentry Vehicle Intercontinental Ballistic Missile (SICBM)), Tactical Air Force Statement of Operational Need (SON) 306-86 (Nuclear Tactical Air Surface Missile (SRAM T)), SAC SON 002-85, (Aircraft Delivered Weapon to Counter Deeply Buried, Hardened Targets), SAC System Operational Requirements Document 13-82-111, Advanced Cruise Missile System, and SAC SON 009-84 (Weapon to Counter Deeply Buried Superhard Time-Urgent Targets).

Program Element: #0604222F Budget Activity: #6 - Defense Wide Mission Support
PE Title: Nuclear Weapons Support

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

(U) Project 5708, Nuclear Weapons Support: Funds ASD/ENN civilians to technically support all new and fielded USAF Nuclear Systems.

(U) FY 1990 Accomplishments:
- (U) Supported new and modified aircraft integration and use control forums
- (U) B61-3/4/7/10, W80-0/1, and B-83 increased stockpile
- (U) W84 (GLCM) warhead stockpile partially returned to inactive reserve
- (U) W89 continued Phase 4 Production Engineering
- (U) W61, EPW, began Phase 3, Development Engineering
- (U) W91, SRAM T, completed Phase 2A and began Phase 3
- (U) Maintained and updated documentation supporting nuclear stockpile and DOE/DOD agreements
- (U) Supported all Air Force and DOD nuclear weapon standardization efforts
- (U) Completed prototype of SAC SURAD cable
- (U) Conducted ATSD(AE) directed safety review of older nuclear weapons
- (U) Supported nuclear safety design efforts on Small ICBM, Peacekeeper Rail Garrison, and Minuteman REACT and Rivet Mile upgrades
- (U) Completed new Nuclear Surety MIL-STD

(U) FY 1991 Planned Program:
- (U) Continue FY 1990 programs at the same level of effort
- (U) Complete AFSC directed reorganization of WL/NTS to ASD/ENN
- (U) Assume LPO responsibilities for all USAF nuclear warheads
- (U) Study older weapon safety issues as modernization programs slow
- (U) Prepare for stockpile adjustments required by DOE facility shortfalls
- (U) Help AF implement Drell Panel Recommendations
- (U) Perform safety studies/reviews on B-1B, F-15E, PA-200, and B-52G
- (U) Complete retirement of BGM-109G Gryphon
- (U) W89 continued Phase 4, Production Engineering
- (U) W87 continued integration activities for Rail Garrison
- (U) W61 and W91 - continued Phase 3, Development Engineering
- (U) Perform safety studies on older weapon system W69, B57, B61-0,1, W56, W62, and W78.

Program Element: #0604222F Budget Activity: #6 - Defense Wide
PE Title: Nuclear Weapons Support
Mission Support

(U) FY1992 Planned Program:
- (U) Continue same level of effort
- (U) Increase conversion of military to civilian positions
- (U) Perform Technology Improvement Studies
- (U) Continue implementation of Drell Panel Recommendation
- (U) Perform approximately eight major safety studies/reviews
- (U) Perform Technology Improvement Studies

(U) FY1993 Planned Program:
- (U) Continue FY 1992 level of effort
- (U) Complete conversion of military to civilian positions

(U) Program to completion:
- (U) This is a continuing program required as long as nuclear weapons are in the inventory

(U) Work Performed By: Aeronautical Systems Division, Directorate of Nuclear Surety (ASD/ENN) - formerly Weapons Laboratory (WL/NTS), Kirtland AFB, NM.

(U) Related Activities:

-(U) PE 0602601F Nuclear Safety (Note: Combined with PE 64222 in FY92)
-(U) PE 0101219 (SICBM); PE 0604312F (ICBM Modernization).
-(U) PE 0101215 (Peacekeeper); PE 0101213 (MM II).
-(U) PE 0101213F (MM Squadrons).
-(U) PE 0604361F (ALCM); PE 0603319F (ACM); 0101120F (ACM).
-(U) PE 0603364F (SRAM II); PE 0207135F (SRAM T).
-(U) PE 0101113F (B-52 Offensive Avionics System).
-(U) PE 0101115F (FB-111B/C); PE 0101118F (SRAM A).
-(U) PE 0101126F (B-1B); PE 0604226F (B-1B).
-(U) PE 0101127 (B-2).
-(U) PE 0207130F/0207134F (F-15E Squadrons).

(U) Other Appropriation Funds: DOE nuclear weapon RD&T, production, and surveillance for AF systems are funded separately in DOE TOA at over $1 to 3 billion per year.

(U) International Cooperative Agreements: Non-US NATO agreements created on a weapon system by weapon system basis.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604226F Budget Activity: #3 - Strategic Programs
PE Title: B-1B

A. (U) RESOURCES ($ in Thousands)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
001	B-1B					
	0	0	3574	209	TBD	TBD
Total	0	0	3574	209	TBD	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Funds included in this program element cover the costs associated with developing an anti-ice system for the B-1B. Funds are also included to cover the costs associated with future START related activities that will affect the B-1B.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993

1. (U) 001, B-1B
Funds in this PE provide for development of an anti-icing system for the B-1B and also provide for expenses associated with future START related activities that will affect the B-1B.

(U) FY 1990 Accomplishments:
- (U) No RDT&E funds were expended for this project during FY 1991.

(U) FY 1991 Planned Program:
- (U) No RDT&E funding is plannned for FY 1991.

(U) FY 1992 Planned Program:
- (U) Selection of desired anti-icing system will have been made and initial development work will begin.

(U) FY 1993 Planned Program:
- (U) Funding is provided to cover the costs associated with future START related activities.

(U) Work Performed By: The contractor to perform the anti-ice modification has not been identified at this time.

(U) Related Activities: N/A

(U) Other Appropriation Funds ($ in Thousands):
(U) Not applicable.

(U) International Cooperative Agreements:
(U) Not applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604227F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: Training Systems Development

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2325 Simulator Development Activities	1,690	3,500	3,500	3,600	Cont	TBD
2769 Simulator Update Development/Simulator Requirements Definition	5,341	1,550	3,399	3,800	Cont	TBD
2851 Standard DOD Simulator Data Base/Common Transformation Program	3,046	2,000	3,500	3,600	Cont	TBD
2901 B-1B Weapon Systems Trainer	2,438	3,000	5,354	3,700	0	132,465
2968 Modular Simulator Design	1,308	1,000	2,400	1,900	Cont	TBD
2998 LANTIRN Simulator	749	0	0	0	0	25,024
3135 Advanced Training System (ATS)	5,120	8,200	6,914	4,100	7,300	39,800
3282 C-17 Aircrew Training System	21,500	8,098	3,000	1,100	500	94,600
3772 C-141 Aircrew Training System	9,727	11,000	3,911	805	500	32,100
3775 Manpower, Personnel, and Training	400	400	700	700	Cont	TBD
4022 Simulator for Electronic Combat Training (SECT)	0	100	17,730	14,077	4,500	36,107
4033 Joint Primary Aircraft Training System (JPATS)	0	0	1,337	400	36,818	38,555
TOTAL	51,319	38,848	51,745	37,782	Cont	TBD

Element: #0604227F
PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide Mission Support

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is a continuing program element for development of aircrew and maintenance training techniques and devices. Objectives are to adapt simulation technology and standards developed in the laboratories and industry to satisfy training requirements, and to develop prototype training devices.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993

1. (U) Project 2325 - Simulator Development Activities: Provides the funds to conduct engineering development of new aircrew/maintenance training technologies and standards. Funds the pre-production of first article training devices to satisfy the customer's training requirements. Identifies and corrects deficiencies in current training capabilities, develops tools that improve aircraft and simulator concurrency and reduce system life cycle costs. Project 2325 is a continuing project that transitions laboratory developments into acquisition requirements.

(U) FY 1990 Accomplishments:
- (U) Conducted Front-End-Analysis (FEA) for Universal Threat Simulator System.
- (U) Conducted FEA for European Low Altitude Training System.
- (U) Identified maintenance training requirements.

(U) FY 1991 Planned Program:
- (U) Determine flight simulator motion requirements and develop the algorithms for the simulator drive mechanism.
- (U) Complete development of motion/force cueing module.
- (U) Update current Instructional System Development (ISD) process

(U) FY 1992 Planned Program:
- (U) Begin second generation low cost, lightweight helmet coupled image generation and projection device.
- (U) Begin design of Universal Threat Simulator System.
- (U) Continue training effectiveness study of visual systems.

(U) FY 1993 Planned Program:
- (U) Complete work on Standard DoD universal threat simulator.
- (U) Complete visual system effectiveness study.

(U) Work Performed By: The Training Systems SPO, ASD, Wright-Patterson AFB OH. Contractors include JWK International Annandale VA; SIMTEC, Manassas VA; ECC Corporation, Wayne,PA; Logicon, San Diego CA.

Element: #0604227F
PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide Mission Support

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

2. (U) Project 2769 - Simulator Update Development/Simulator Requirements Definition: Develops updates to training systems to maintain and improve their supportability and effectiveness. This project is also used to: a) Define requirements for new training systems in the form of tasks to be trained (this supports a Milestone 0 decision). b) Develop options to meet the requirements (this supports a Milestone 1 decision). c) Build a prototype of one or more of the options to evaluate the training effectiveness of those options.

(U) FY 1990 Accomplishments:
- (U) Conducted C-130 ATS summative evaluation.
- (U) Completed C-130 ATS readiness review: Aug 90.

(U) FY 1991 Planned Program:
- (U) Develop and evaluate prototypes for the visual low altitude training system.

(U) FY 1992 Planned Program:
- (U) Complete visual low altitude training system analysis.
- (U) Begin training requirements definition for JSTARS.
- (U) Begin training system analysis for KC-135 contractor training.

(U) FY 1993 Planned Program:
- (U) Complete JSTARS training definition/validation.
- (U) Complete KC-135 analysis/validation.
- (U) Begin work to incorporate mission rehearsal into existing training systems.

(U) Work Performed By: The Training Systems SPO, ASD, Wright-Patterson AFB OH. Prime contractors are CAE-Link, Dallas, Texas; JWK Annandale, VA; ECC Corporation Wayne, PA.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

Program Element: #0604227F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: Training Systems Development

3. (U) Project 2851 - Standard DOD Simulator Data Base/Common Transformation Program: Develops a standard DOD digital data base generation system, enhancement and exchange standards; and a library and distribution function. This minimizes database redundancy among the services and maximizes database utility and interoperability. This project will also allow all training systems to share a common visual database.

(U) FY 1990 Accomplishments:
- (U) Renegotiated contract to fixed price and added more testing.
- (U) Developed draft MIL-STD database interchangeablilty format.
- (U) Began rapid data generation and photo input top level design

(U) FY 1991 Planned Program:
- (U) Complete rapid database generation and photo input design.
- (U) Initiate test of database interchange formate and photo based input.

(U) FY 1992 Planned Program:
- (U) Begin industry/government system-level test of software and products.
- (U) Complete database interchange and input capabilities.

(U) FY 1993 Planned Program:
- (U) Complete testing.
- (U) Initiate interim operation and upgrade of hardware to production system capacity.

(U) Work Performed By: The Training Systems SPO, ASD, Wright- Patterson AFB OH. Contractor is Planning Research Corporation, McLean VA.

(U) Related Activities:
- (U) Project 2851 is a joint service project conducted under the Joint Logistic Commanders (JLC) through the Joint Technical Coordinating Group for Training Systems and Devices.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

4. (U) Project 2901 - B-1B Weapon System Trainer: Develops aircrew training devices for all B-1B crew members to include mission rehearsal, takeoff and landing, navigation, air refueling, threat analysis/countermeasures, low-level penetration, weapons delivery, and emergency procedures.

(U) FY 1990 Accomplishments:
- (U) Delivered Version 3 update for Cockpit Procedures Trainers.
- (U) Delivered three Weapon System Trainers (WST).

Element: #0604227F
PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide Mission Support

(U) FY 1991 Planned Program:
- (U) Deliver final two WSTs and two Mission Trainers.
- (U) Develop aircraft generated modifications to trainers.
- (U) Deliver version two software for WSTs.

(U) FY 1992 Planned Program:
- (U) Deliver overwing fairing modification on all trainers.
- (U) Complete testing and deliver Version 3 software for WSTs.
- (U) Develop aircraft driven Block 4.5 merge 3 software update.

(U) FY 1993 Planned Program:
- (U) Deliver block 4.5 merge 3 update.
- (U) Incorporate defense stations updates.

(U) Work Performed By: The Training Systems SPO, ASD, Wright-Patterson AFB OH. Prime contractor; Boeing Military Co., Huntsville AL.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

5. (U) Project 2968 - Modular Simulator Design: Develop a MIL-STD for flight simulator software modules. Standardizing the functions of each simulator module and its interfaces to all other modules (in the Ada programming language) will allow reuse of software from one simulator to the next and simplify the job of updating module software to maintain simulator concurrency with aircraft.

(U) FY 1990 Accomplishments:
- (U) Conducted Critical Design Review.
- (U) Completed draft military standard for modular simulators.
- (U) Developed modular simulator software.

(U) FY 1991 Planned Program:
- (U) Complete draft standard for modular simulators.
- (U) Demonstrate concept and validate on F-16 simulator.

(U) FY 1992 Planned Program:
- (U) Publish standards for future acquisitions.
- (U) Demonstrate networking capability.
- (U) Analyze advanced avionics compatibility for modular simulation.

(U) FY 1993 Planned Program:
- (U) Develop propulsion module and radar modules.
- (U) Incorporate DoD Standard Data Base into visual modules.

(U) Work Performed By: The Training Systems SPO, ASD Wright-Patterson AFB OH. Prime contractor; Boeing Military Airplane Co., Huntsville AL.

Element: #0604227F
PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide Mission Support

(U) Related Activities:
- (U) Project 2968 is a joint service project conducted under the Joint Logistic Commanders (JLC) through the Joint Technical Coordinating Group for Training Systems and Devices.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

6. (U) Project 3135 - Advanced Training System (ATS): Changes to the Air Force Training environment have resulted in an increased training workload at Air Training Command (ATC) Technical Training Centers. Increasing equipment complexity, together with greater student instructional needs, combine to heavily tax ATC's instructor resources. The manual ATC system is becoming increasingly inefficient and inflexible. ATS will support all the major functions in the technical training arena, e.g. instructional development, delivery, evaluation, and resource management. Its main goals are to free instructors for individualized instruction in complex, highly technical tasks; promote efficient training methods; and provide rapid course creation and updating.

(U) FY 1990 Accomplishments:
- (U) Completed ATS Preliminary Design Review (PDR).
- (U) Completed Software Specification Review.
- (U) Updated life cycle cost estimate and cost/benefits analysis.

(U) FY 1991 Planned Program:
- (U) Critical Design Review for system architecture, courseware and evaluation modules.

(U) FY 1992 Planned Program:
- (U) Begin development of courseware and evaluation modules.
- (U) Critical Design Review for Schedule/Management Modules
- (U) Start test and evaluation of courseware and evaluation module.

(U) FY 1993 Planned Program:
- (U) Begin development of Schedule/Management module.
- (U) Complete system test and evaluation.

(U) Work Performed By: Advanced Training System SPO, HSD, Brooks AFB TX. Contractor is IBM, Federal Systems Division, Manassas VA.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

Element: #0604227F Budget Activity: #6 - Defense-Wide
PE Title: Training Systems Development Mission Support

(U) International Cooperative Agreements: Not applicable.

7. (U) Project 3282 - C-17 Aircrew Training System (ATS): Provides initial and continuation training for C-17 aircrew members. Training will be totally contractor administered and supported, with MAC evaluating the final product - a fully qualified aircrew member. The training system will be developed concurrently with the aircraft development and production efforts, allowing the first main operating base (MOB) to be available for training at the initial squadron.

(U) FY 1990 Accomplishments:
- (U) Conducted preliminary design review.
- (U) Initiated development of courseware.

(U) FY 1991 Planned Program:
- (U) Conduct critical design review.
- (U) Begin fabrication of training devices.
- (U) Continue courseware development.

(U) FY 1992 Planned Program:
- (U) Conduct site training readiness review at Charleston AFB.
- (U) Complete courseware development.
- (U) Train initial squadron crews at Charleston AFB.
- (U) Continue fabrication of training devices for Altus AFB.

(U) FY 1993 Planned Program:
- (U) Develop and incorporate all outstanding (aircraft driven) training change requirements

(U) Work Performed By: Training Systems SPO, ASD, Wright-Patterson AFB OH. Contractor is McDonnell Douglas Training Systems Inc., Bedford, TX.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force of the Department of Defense.

(U) Other Appropriation Funds:

Aircraft Procurement (BP 1000):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	42,100	7,600	1,700	104,125	159,000	313,400

(U) International Cooperative Agreements: Not applicable.

Element: #0604227F
PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide Mission Support

8. (U) Project 3772 - C-141 Aircrew Training System (ATS)
C-141 ATS will be a totally contracted effort for the ground and flight simulation aircrew training programs, including initial qualification, upgrade and continuation training, for all MAC, AFRES and ANG C-141 primary crew members. The system will also include the Basic Flight Engineer School at Altus AFB. The contractor will also provide for the logistics support of all ATS associated training equipment and operate a training management system to track student progress, update the training programs and interface with Air Force Operations Resource Management System. The ATS will include both active and air reserve component C-141 operating locations.

(U) FY 1990 Accomplishments:
- (U) Conducted Training System Review.
- (U) Began courseware development.
- (U) Negotiated visual system engineering change proposal.

(U) FY 1991 Planned Program:
- (U) Begin course readiness reviews.
- (U) Deliver prototype training equipment.
- (U) Conduct training validation.

(U) FY 1992 Planned Program:
- (U) Complete formal school development.
- (U) Deliver computer based training.
- (U) Begin simulator production.

(U) FY 1993 Planned Program:
- (U) Begin training validation.
- (U) Continue production.

(U) WORK PERFORMED BY: The Training Systems SPO located at Aeronautical Systems Division, Wright-Patterson Air Force Base OH manages this effort. The prime contractor for this program is Hughes Training Systems, Arlington, TX.

(U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

Aircraft Procurement (BA 3010) :

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	100	2,400	8,831	9,523	4,700	25,554

Element: #0604227F
PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide Mission Support

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

9. (U) Project 3775 - Manpower, Personnel and Training (MPT): This program will develop training courses for personnel who are involved in identifying requirements and constraints for new acquisitions or modifications. It sponsors research and development of MPT tools, models and databases. It mandates early analysis and integration of human factors in system design and engineering, and emphasizes the most effective and efficient use of personnel to lower life-cycle costs.

(U) FY 1990 Accomplishments:
- (U) Developed Senior Executive Seminar.
- (U) Developed Planning Team Handbook.
- (U) Developed Familiarization Course.
- (U) Initiated MPT requirements identification process.

(U) FY 1991 Planned Program:
- (U) Develop System Integration Specialist Course.
- (U) Conduct front-end analysis/requirement identification.
- (U) Develop MPT integrated data base.
- (U) Update training courses.

(U) FY 1992 Planned Program:
- (U) Complete development System Integration Specialist Course.
- (U) Continue front-end analysis/requirement identification.
- (U) Complete MPT integrated data base.
- (U) Develop analysis models and tools.

(U) FY 1993 Planned Program:
- (U) Conduct MPT courses and seminars.
- (U) Continue front-end analysis work.
- (U) Continue work on analysis models and tools.

(U) Work Performed By: Deputy for Acquisition Logistics, Wright-Patterson AFB OH. Contractors Hay System Inc., Washington DC, and Automation Research Systems Ltd, Alexandria, VA.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

Element: #0604227F
PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide Mission Support

10. (U) Project 4033 - Joint Primary Aircraft Training System (JPATS): Pilot training is being modified from the current single-track system into a more specialized system. To do this, training will consist of a single track primary phase and a dual track advanced phase. The primary phase is the JPATS. The objective of both the Navy and the Air Force is to jointly acquire an integrated training system using similar hardware with like capabilities. Components of the system include, simulators, curricula, contract logistic support and aircraft. This project represents the ground based training protion of the system.

(U) FY 1990 Accomplishments: Not applicable.

(U) FY 1991 Planned Program: Not applicable

(U) FY 1992 Planned Program:
- (U) New start
- (U) Conduct front end requirements analysis study.
- (U) Establish System Management Office.

(U) FY 1993 Planned Program:
- (U) Build Request For Proposal.
- (U) Conduct Source Selection.

(U) Work Performed By: Training Systems SPO, Wright-Patterson AFB OH. Contractor(s) to be determined.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1992/1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604227F Project Number: 4022
PE Title: Training Systems Development Budget Activity: # 6 - Defense-Wide Mission Support

A. (U) RESOURCES: ($ in Thousands)
Project Title: Simulator for Electronic Combat Training (SECT)

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Simulator for Electronic Combat Training (SECT)	0	100	17,730	14,077	4,500	36,107

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The SECT will replace outdated simulation devices that support Electronic Warfare Officer Training. The simulator will train USAF, Canadian, and other allied officers in basic threat recognition and associated electronic combat procedures in a simulated airborne environment. This training is possible only with simulation due to environment, security and range restrictions.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments: Not applicable.

2. (U) FY 1991 Planned Program:
   - (U) Training requirements analysis completed.
   - (U) Release Request For Proposal.
   - (U) Award contract.

3. (U) FY 1992 Planned Program:
   - (U) Complete Preliminary Design Review.
   - (U) Complete Critical Design Review.
   - (U) Begin software development.

4. (U) FY 1993 Planned Program:
   (U) Begin hardware development.
   (U) Complete engineering development.
   - (U) Begin in-plant test of system.

5. (U) Program to Completion:
   - (U) Deliver system to Beale AFB.
   - (U) Complete acceptance testing.

D. (U) WORK PERFORMED BY: The Training Systems SPO located at Aeronautical Systems Division, Wright-Patterson Air Force Base OH manages this effort. The prime contractor for this program has not be selected.

Program Element: #0604227F Project Number: 3772
PE Title: Training Systems Development Budget Activity: #6 - Defense-Wide Mission Support

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION:

- (U) Air Training Command (ATC) Statement of Need (SON) 01-89, Simulator for Electronic Combat Training (SECT), 24 Mar 89.

- (U) Air Training Command (ATC) System Operational Requirements Document (SORD), 001-88-I 2 Aug 90.

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

- (U) Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

1. (U) Contract Award	Sep 1991
2. (U) Critical Design Review	Oct 1992
3. (U) Test and Evaluation	Mar 1994

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604231F
PE Title: C-17 Program

Project: #xxx1
Budget Activity: #4-Tactical Programs

Project Title: C-17



POPULAR NAME: C-17

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Major Contract	R&D 812,378	R&D 443,035	R&D 460,600	R&D 139,600	R&D 71,500
Support Contract	N/A	N/A	N/A	N/A	N/A
In-House Support	6,600	15,400	15,976	21,998	7,400
GFE/ Other	53,996	77,790	100,783	57,839	22,119
Total	873,643	536,225	577,359	219,437	101,019
SCHEDULE	**FY 1990**	**FY 1991**	**FY 1992**	**FY 1993**	**To Complete**
Program Milestones	N/A	N/A	N/A	IIIB 1st Qtr FY94	N/A
Engineering Milestones	N/A	N/A	N/A	N/A	N/A
T&E Milestones	N/A	1st Flight Jun 91	N/A	Complete DT&E/IOT&E Aug 93	N/A
Contract Milestones	Lot III 4A/C Dec 90	Prod 1st Flt Dec 91	Lot IV 6A/C Dec 91	Lot V 12A/C Nov 92	Remaining Lots TBD

Program Element: #0604231F
PE Title: C-17 Program
Project: #xxx1
Budget Activity: #4-Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

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 U.S. mobility requirements and is tailored to respond to contingencies anywhere in the world. Specific tasks associated with the airlift mission area include deployment, employment (airland, airdrop, and extraction), sustaining support, retrograde, and combat redeployment. The C-17 will be capable of performing the entire spectrum of airlift missions and is specifically designed to operate effectively and efficiently in both the intertheater and intratheater environments. Therefore, it will not only increase our overall airlift capability, but will be able to replace the capability lost from retiring some C-130 and C-141 aircraft beginning in the 1990s. The C-17 will be a modern technology aircraft capable of performing the airlift mission well into the 21st century.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Avionics/software integration continued
   - (U) The tooling effort to support low-rate production requirement completed
   - (U) Planning for the RDT&E flight test aircraft air load full calibrations completed
   - (U) Full scale durability and static articles assembly continued
   - (U) Engine integration testing began
   - (U) Technical and logistics analyses continued
   - (U) Flight test aircraft assembly continued
   - (U) System level testing began

2. (U) FY 1991 Planned Program:
   - (U) Complete O&I level support equipment critical design reviews
   - (U) Complete procurement of GFE mission flight test spares
   - (U) Engineering design and drawing releases will be completed
   - (U) Complete assembly of durability article
   - (U) Begin durability and static testing
   - (U) Complete assembly of static article
   - (U) Complete assembly of test aircraft (T-1)
   - (U) First flight Jun 91
   - (U) Avionics/software integration continued
   - (U) Development of detailed test planning concentrating on full-scale durability and static articles, and RDT&E test aircraft will be completed
   - (U) First production aircraft (P-1) delivered to airloads calibration testing (start & complete)

Program Element: #0604231F Project Number: xxx1
PE Title: C-17 Program Budget Activity: #4-Tactical Programs

3. (U) FY 1992 Planned Program:
   - (U) Complete static article ultimate strength testing
   - (U) Complete O level technical order validation
   - (U) Deliver maintenance/aircrew trainers
   - (U) Functional Configuration Audit/Physical Configuration Audit
   - (U) Complete one life of durability testing
   - (U) Continue developmental testing

4. (U) FY 1993 Planned Program:
   - (U) Begin dedicated IOT&E
   - (U) Complete 2nd life durability test
   - (U) Combined DT&E/IOT&E complete (Except all weather testing)

5. (U) Program to Completion:
   - (U) Flight/weather testing completed
   - (U) Milestone IIIB Complete

D. (U) WORK PERFORMED BY: Douglas Aircraft Company, Long Beach, California.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: The current estimates for the maintenance, MTBMI, MTBMC, MTBR, and Mean Manhours to Repair parameters have been changed to account for the latest analyses and aircraft design. Also, the current estimate for the payload/range, landing and takeoff distance have been adjusted to account for the latest projected operating weight. The reported payload/range is 3928 pounds short of specification requirements using the specification ground rules. However, the maximum payload/range (160,000lbs/2400nm) threshold will be met.

2. (U) SCHEDULE CHANGES: IOC date (Aug 94) reflects delivery of P-16 under the 120 aircraft delivery schedule in Jul 94. P-5 through P-16 will be the 12 aircraft required to declare IOC. The FY01 FOC also reflects the new delivery profile for 120 aircraft. The new profile reflects SECDEF's MAR decision and the FY 91 Appropriations Bill.

3. (U) COST CHANGES: RDT&E: (+$253,200,000) This increase is the result of the reestimate of prime contract costs at ceiling for Air Vehicle, Test, Training, Data, Peculiar Support Equipment, and System Engineering/Program Management and other government costs. PROCUREMENT: (TBD) This decrease is the result of a buy profile change for a reduction in total aircraft and incorporation of a slower buildup rate.

F. (U) PROGRAM DOCUMENTATION:
   - (U) SON (MENS) Nov 80
   - (U) SORD (SOC) Apr 88
   - (U) DCP Jun 88
   - (U) ADM 6 Nov 89
   - (U) Acquisition Program Baseline - Revision submitted to OSD Dec 90.
   - (U) TEMP - Approved 4 Oct 88, revision 4 signed by PEO, 14 Aug 90.

Program Element: #0604231F
PE Title: C-17 Program
Project Number: xxxl
Budget Activity: #4-Tactical Programs

G. (U) RELATED ACTIVITIES: None. There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

1. (U) PROCUREMENT (PE #0401130F):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	To Comp	Total Prog
Funds	1,502.3	475.5	2173.9	23344.1	29253.4
Quantity	4	0	6	104	120

2. (U) MILITARY CONSTRUCTION (PE #0401130F):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	To Comp	Total Prog
Funds	4.7	29.6	79.5	209.8	327.2

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
None	(Engineering Development, Component Qual.fication Testing, and System Level Testing Only)	

T&E ACTIVITY (TO COMPLETION)

Event	Planned Date	Remarks
Initiate DT&E	Jun 91	None
Initiate Dedicated IOT&E	Jan 93	None
Complete DT&E/IOT&E	Aug 93	None

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604233F Budget Activity: #4 -Tactical Programs
PE Title: Specialized Undergraduate Pilot Training (SUPT)

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Project No. 643853, T-1A (Tanker-Transport) Training System						
	3,142	2,379	3,174	2,705	5,418	18,524
Project No. 644102 Joint Primary Aircraft Training System (JPATS)						
	0	0	1,100	2,210	21,289	24,599
Total	3,142	2,379	4,274	4,915	26,707	43,123

B. (U) BRIEF DESCRIPTION OF ELEMENT: The T-1A (Tanker-Transport) Training System (T-1TS) is required to implement Specialized Undergraduate Pilot Training (SUPT) in Air Training Command. This HQ USAF approved training concept will provide higher quality graduates with skills specifically tailored to the needs of gaining commands. It will replace the T-38 in tanker-transport training and significantly reduce training costs. The acquisition of the T-1A aircraft will also substantially reduce the eventual size of the T-38 replacement fleet thereby providing additional acquisition savings. The T-1A is a derivative of the commercially available Beech 400A "Beechjet" missionized for the training role. The aircraft will accommodate an instructor and two students. The training system will also include compatible simulators, courseware, and ground training devices. The TT syllabus will include training in high and low altitude instrument approaches, crew coordination, asymmetric thrust situations, airdrop fundamentals, low-level navigation, airborne rendezvous, and cell formation. The Joint Primary Aircraft Training System (JPATS) is planned as a joint USAF/USN venture to replace the Service's fleets of primary trainer aircraft (T-37/T-34 respectively) with modern, efficient aircraft and associated ground based training systems. USAF will serve as the lead Service because of its earlier need.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project No. 43853, T-1A (Tanker-Transport) Training System: See PE description above.

(U) FY 1990 Accomplishments:
- (U) Source Selection and Contract Award, 28 Feb 90
- (U) Begin courseware development
- (U) Begin simulator fidelity/compatiblity design/integration

Program Element: #0604233F Budget Activity: #4 - Tactical Programs
PE Title: Specialized Undergraduate Pilot Training (SUPT)

(U) FY 1991 Planned Program:
- (U) Complete missionization of aircraft and simulators
- (U) Take delivery of first aircraft
- (U) Begin QT&E/OT&E of aircraft

(U) FY 1992 Planned Program:
- (U) Mission support
- (U) Start Instructor Pilot (IP) training
- (U) Start student training

(U) FY 1993 Planned Program:
- (U) Deliver final courseware
- (U) Mission Support

(U) Work Performed By: Prime Contractor is McDonnell-Douglas Training Systems (MDTS). Aircraft sub is Beech Aircraft; simulator sub is Quintron. Courseware developed by MDTS.

(U) Related Activities:
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):

(U) Aircraft Procurement (Air Vehicle) (FY 92 PB):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	147,425	163,801	168,681	178,599	499,823	1,158,329
QTY	14	28	37	37	74	191

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project No. 644102, Joint Primary Aircraft Training System (JPATS): Program is planned to acquire a missionized currently available aircraft and to develop associated courseware and training components to replace the T-37 in SUPT. The USAF's T-37 aircraft average over 30 years old. These aircraft are environmentally non-compliant for noise. They have antiquated, increasingly unsupportable and non-representative avionics, and inefficient engines. Cockpits are unpressurized, resulting in the largest number of physiological incidents in the Air Force. This is a joint procurement with the Navy.

(U) FY 1990/1991 Planned Program:
- N/A

(U) FY 1992 Planned Program:
- (U) Integrate T-1A (Tanker Transport) Training System and JPATS into SUPT
- (U) Develop Training System Requirements Analysis to determine proper mix of aircraft, simulators, training aids, and courseware

Program Element: #0604233F Budget Activity: #4 - Tactical Programs
PE Title: Specialized Undergraduate Pilot Training (SUPT)

(U) FY 1993 Planned Program:
- (U) Complete Training System Requirements Analysis (TSRA)
- (U) Release Request for Proposal and Award Contracts
- (U) Flight Demonstrations and Testing

(U) Work Performed By: TBD

(U) Related Activities:
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Aircraft Procurement (Air Vehicle and Spares)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	0	0	0	0	2,565,500	2,565,500
QTY	0	0	0	0	495	495

(U) International Cooperative Agreements: TBD

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604237F Budget Activity: #4 - Tactical Programs
PE Title: Variable Stability In-Flight Simulator Aircraft (VISTA)

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3308 Variable Stability In-Flight Simulator Aircraft (VISTA)	14,455	7,250	2,090	0	0	43,664
Total	14,455	7,250	2,090	0	0	43,664

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program modifies an F-16D to create a high-performance, flying simulator as a replacement for the 40 year old NT-33A. VISTA will have the capability to simulate a wide range of air vehicles to identify crucial flight control and human factor design deficiencies before first flight, to establish flying qualities specification criteria, and operate as a flying laboratory for flight control and cockpit display research. In addition, the Air Force and Navy Test Pilot Schools will use VISTA, as they have the NT-33A, to safely train test pilots to judge the deficiencies and characteristics for aircraft handling quality, avionics, and human factors in a realistic high performance environment. VISTA will be a national facility for flight research.

C. (U) JUSTIFICATION FOR PROJECT LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

(U) Project 3308, Variable Stability In-Flight Simulator Test Aircraft: This program modifies an F-16D to create a high performance, flying simulator known as VISTA, as a replacement for the NT-33A. For the past 34 years, the R&D flight test community has extensively employed the variable stability NT-33A for pre-first-flight evaluation of advanced aircraft, to establish flying quality specification criteria, and as a flying laboratory for flight control and cockpit display research. The NT-33A has been a veritable workhorse with a full schedule of test activities. Its success is directly attributable to its relatively low cost of operation, rapid response to customer needs, and high degree of credibility in the flight test community. The NT-33A has been credited with identification of flight control deficiencies on the prototypes for the YF-17 and F-18. Gone undetected, such deficiencies could have resulted in loss of prototype aircraft. Now, the NT-33A must be replaced. It is the oldest actively flying aircraft in the Air Force inventory and its performance is not representative of future aircraft. VISTA, a modified F-16D, will have the capability to simulate a wide range of air vehicles to identify crucial flight control and human factor design deficiencies before first flight. In addition, the Air Force and Navy Test Pilot Schools will use VISTA, as they have used the NT-33A, to safely train test pilots to judge the deficiencies and

Program Element: #0604237F Budget Activity: #4 - Tactical Programs
Title: Variable Stability In-Flight Simulator Aircraft (VISTA)

characteristics for aircraft handling quality, avionics, and human factors in a realistic high performance environment. VISTA will be a national facility for flight research.

(U) FY 1990 Accomplishments:
- (U) Completed aircraft modifications including all major wiring, hydraulic lines, and structural changes.
- (U) Completed variable stability system hardware and software development.
- (U) Integrated variable stability system components and F-16D flight control system in bench test installation.
- (U) Initiated flight control and variable stability system software validation and verification testing.

(U) FY 1991 Planned Program:
- (U) Complete all aircraft modifications (flight control system and subsystems installation) and final assembly.
- (U) Complete ground testing to ensure design and safety requirements have been met.
- (U) Complete software validation and verification.
- (U) Conduct flight readiness review.

(U) FY 1992 Planned Program:
- (U) Conduct developmental flight testing to verify operational performance.
- (U) Conduct physical and functional configuration audit.
- (U) Complete program and transition VISTA to flight research.

(U) FY 1993 Planned Program:
- (U) Not Applicable.

(U) Work Performed By: This project is managed by the Flight Dynamics Directorate of the Wright Laboratory, Wright Patterson AFB, OH. The VISTA prime contractor is General Dynamics, Fort Worth Division, Fort Worth, Texas.

(U) Related Activities:
(U) PE #0602201F, Aerospace Flight Dynamics.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604239F
PE Title: Advanced Tactical Fighter (ATF) FSD
Project: Not Applicable
Budget Activity: #4-Tactical Programs

Project Title: ATF FSD

ATF is in source selection. No photo available.

POPULAR NAME: ATF

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Major Contract		191,100	1,557,400	2,231,500	8,183,500 (12,163,500)
Support Contract			1,000	1,000	18,000 (20,000)
In-House Support		400	12,100	13,900	84,300 (110,700)
GFE/ Other		6,705	66,682	78,185	603,844 (755,416)
Total		198,205	1,637,182	2,324,585	8,885,563 (13,045,535)
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	(To Complete)
Program Milestones		DAB II Jun 91			DAB IIIA 1QFY97
Engineering Milestones			Initial Design Rev 4 Q	Fab Design Rev 4 Q	First Flight 4QFY95
T&E Milestones				First FSD Engine to Test	DT 1 IOT&E
Contract Milestones		FSD CA* Jul 91			

*Contract award contingent upon Congressional resolution of FSD start date.

Program Element: # 0604239F | Project: Not Applicable
PE Title: Advanced Tactical Fighter (ATF) FSD | Budget Activity: #4-Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The ATF Program will develop the next-generation air superiority fighter for introduction in the early 2000's to counter the emerging worldwide threat. The ATF is designed to penetrate enemy airspace and achieve a first-look, first-kill capability against multiple targets. The ATF Full Scale Development (FSD) effort will be based on the Weapon System Specification formulated from data developed during the Dem/Val (Prototype) phase. The FSD program will consist of design, fabrication, and development testing of 11 FSD flight test vehicles(9 single and 2 dual seat); updating of Avionics Flying Laboratory (AFL) and using it to develop and integrate the FSD avionics suite; design and development of support and training systems. The ATF program from the outset has placed balanced emphasis on performance, survivability, reliability/maintainability and affordability. The ATF concept is characterized by an advanced materials airframe, a new engine, balanced controlled observables and advanced avionics in a highly integrated design.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments: Not Applicable. (Dem/Val activities are carried out in PE 0603230F.)

2. (U) FY 1991 Planned Program:
   - (U) Complete Demonstration/Validation flight schedule.
   - (U) Conduct FSD source selection and award contracts to winning weapon system contractor team and winning engine contractor.
   - (U) Initiate design of FSD aircraft and support elements; continue design of FSD engines.

3. (U) FY 1992 Planned Program:
   - (U) Weapon system initial design reviews will be completed in FY 1992.
   - (U) Upgrade avionics ground prototype to a system integration laboratory (SIL) to develop and test the full-up ATF integrated avionics architecture.
   - (U) Initiate validation of Common Avionics specifications.
   - (U) Use winning contractors' Prototype Air Vehicles (PAVs), completed AFL and prototype engines to provide initial flight environment experience and development for emerging avionics components and other subsystems.
   - (U) Support and training systems requirements reviews.
   - (U) Initiate fabrication and assembly of FSD ground test engines.
   - (U) Critical Design Review (CDR) for FSD engine will be completed in FY 1992.

4. (U) FY 1993 Planned Program:
   - (U) Fabrication design reviews will be completed in FY 1993.
   - (U) Continued use of PAVs and AFL until FSD aircraft are available.
   - (U) First FSD engine to test (FETT).
   - (U) Initiate fabrication and assembly of FSD flight test engines and aircraft.
   - (U) Support and training systems design reviews will be conducted.

Program Element: # 0604239F
PE Title: Advanced Tactical Fighter (ATF) FSD
Project: Not Applicable
Budget Activity: #4-Tactical Programs

5. (U) Program to Completion:
   - (U) Program review to authorize long lead for pre-production verification (PPV) aircraft.
   - (U) Eleven FSD aircraft will be delivered (FY 1995 to FY 1998).
   - (U) Testing will be conducted with these aircraft to include: weapon compatibility, performance, flying qualities, observables, integrated avionics, climatics, SEEK EAGLE, support and training systems compatibility, and completion of Development ,Test & Evaluations (DT&E) and Initial Operational Test and Evaluation (IOT&E) (FY 1995 to FY2000).

D. (U) WORK PERFORMED BY: The ATF FSD program will be managed by the Aeronautical Systems Division (ASD), Wright-Patterson AFB, OH. At the completion of the ongoing Dem/Val phase in FY 91, the government will conduct an ATF FSD source selection and award contracts to a single airframe manufacturer and single engine contractor. Many major contractors are currently involved in the competition either as a prime contractor, team member, or subcontractor. The FSD source selection decision (downselect) is scheduled for April 1991.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES:
   - (U) Avionics, PAV, and FSD flight test engines activities were included in the FY 91 planned program in error. They are now correctly covered in FY 92 and FY 93 planned program.
   - (U) Two dual seat trainers have been added to FSD deliveries to be completed by FY 1998.
   - (U) FSD aircraft delivery schedule in previous Program to Completion was in error and has been corrected to reflect FY 1998 completion.

3. (U) COST CHANGES: $2,750,894 increase since last President's Budget (PB). The avionics suite has been finalized, the FSD program was extended to allow for a later start of production, 2 dual seat trainers and an additional 1% base fee have been included. FY 92 PB inflation rates were applied.

F. (U) PROGRAM DOCUMENTATION:
   - (U) TAF SON 304-83, 9 Nov 84
   - (U) PMD 7036(13)/0603230F/0604239F, 19 Jul 90
   - (U) ATF TEMP, 23 Mar 90
   - (U) ATF APB, 9 Oct 90

G. (U) RELATED ACTIVITIES:
   - (U) PE 0603230F, ATF (Dem/Val), focused on the ATF mission and is performing risk reduction demonstrations prior to entering FSD.
   - (U) PE 0604250F, Preliminary FSD for Integrated Electronic Warfare Systems/Integrated Communications, Navigation, Identification Avionics (INEWS/ICNIA) provided the common core set of integrated avionics module designs for integration into the overall weapon system and continued test and validation of ATF applicable avionics modules (FY 88-91).

Program Element: # 0604239F
PE Title: Advanced Tactical Fighter (ATF) FSD

Project: Not Applicable
Budget Activity: #4-Tactical Programs

- (U) PE 0207219F, ATF Procurement planned for FY 1996 with advanced buy in FY 1995.
- (U) PE 0603231N, Navy ATF (NATF) Dem/Val Phase III was planned for FY 1991 through 1993 and Navy FSD start was planned for FY 1994. However, Navy has terminated funding for NATF beginning in FY 1992.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands): Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS): Not Applicable.

T&E ACTIVITY (TO COMPLETION)

	Event	Planned Date	Remarks
(U)	First Flight	4Q FY95	
(U)	DT 1	4QFY95-1QFY00	
(U)	IOT&E	4QFY97-1QFY00	
(U)	OT 1	3QFY99-1QFY00	

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604240F
PE Title: B-2 (ATB)

Project: # N/A
Budget Activity: #3-Strategic Programs

Project Title: Advanced Technology Bomber (ATB)

POPULAR NAME: B-2



BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Major Aircraft	1,777,620	1,512,285	1,386,411	671,411	290,642
Support Contract	2,785	959	1,012	1,234	1,839
In-House Support	10,100	9,010	7,000	6,000	13,000
GFE/ Other	69,182	212,726	168,649	150,999	195,509
Total	1,859,687	1,734,980	1,563,072	829,644	500,990
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	(To Complete)
Program Milestones	Block 1 Testing		Production Decision	First SAC Delivery	
Engineering Milestones					
T&E Milestones		Start L/O Testing 1st Flt AV-2			
Contract Milestones					

Program Element: #0604240F
PE Title: B-2 (ATB)
Project: # N/A
Budget Activity: #3-Strategic Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The B-2 is a multi-role strategic bomber with exceptional range and payload that is capable of performing both conventional and nuclear delivery roles. The B-2 is an all-wing, two-place aircraft with provisions for a third crew member. The aircraft is equipped with twin weapon bays of over 20,000 pounds capacity each. It is powered by four F-118-GE-100 turbofan engines. The B-2 exploits recent breakthroughs in low observable technology to achieve reduced vehicle signatures which allow penetration of current and postulated Soviet defenses. Deployment of the B-2 will address the national requirement to increase our targeting flexibility and to revitalize our strategic deterrent forces. The B-2 program will significantly enhance the manned bomber portion of the strategic TRIAD, while preserving the vitally needed flexibility for worldwide non-nuclear force projection.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Program:
   - (U) B-2 system development with emphasis on flight test activities of the FSD aircraft
   - (U) Flight testing of navigation and radar systems on C-135 test bed
   - (U) Testing of the D&DT airframe and initial testing of static airframe

2. (U) FY 1991 Planned Program:
   - (U) Continue system development with flight test using additional air vehicles
   - (U) Continue flight testing of navigation and radar systems on C-135 test bed
   - (U) Testing of the D&DT airframe and initial testing of static airframe

3. (U) FY 1992 Planned Program:
   - (U) Continue system development with flight test using additional air vehicles
   - (U) Continue flight testing of navigation and radar systems on C-135
   - (U) Testing of the D&DT airframe and testing of static airframe

4. (U) FY 1993 Planned Program:
   - (U) Continue system development with flight test
   - (U) Continue flight testing of navigation and radar systems on C-135
   - (U) System development flight test to include testing of Preplanned Product Improvements (P3I) systems, modifications and upgrades

D. (U) WORK PERFORMED BY: The B-2 program is managed by the B-2 System Program Office, Aeronautical Systems Division, Wright-Patterson AFB, Ohio. Northrop Corporation, B-2 Division, Pico Rivera, California is the B-2 prime contractor, and has overall integration responsibility for the development and production of the B-2. Boeing Military Airplane Company, Seattle, Washington, and LTV, Dallas, Texas are major subcontractors developing airframe components. General Electric Company, Aircraft Engine Group, Cincinnati, Ohio is responsible for the development of the B-2 propulsion system. Several government agencies provide specialized assistance to the program. Included in these are the Air Force Materials Laboratory, Air Force Avionics Laboratory at Wright-Patterson, AFB, Ohio, and the Arnold Engineering Development Center, Tennessee. The majority of the flight test activity will be accomplished at the Air Force Flight Test Center, Edwards AFB, California and will use numerous Department of Defense test ranges.

Program Element: #0604240F
PE Title: B-2 (ATB)
Project: # N/A
Budget Activity: #3-Strategic Programs

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: There have been no major technical changes.

2. (U) SCHEDULE CHANGES:

3. (U) COST CHANGES: The Secretary of Defense, as a result of the Major Aircraft Review, reduced the B-2 buy from 132 to 75 and reduced the cost of the program to $62.8B. The FY 91 budget and subsequent FY 92-97 budget estimates were changed accordingly.

F. (U) PROGRAM DOCUMENTATION:

- (U) SAC SON 007-89-0, dated Feb 1990
- (U) SAC SORD 007-89-I/II/III, dated Feb 1990, revised Jun 1990
- (U) PMD 2020(7), dated 14 Mar 1990
- (U) PMD Change 1, 2020(8), dated 24 Sep 1990

G. (U) RELATED ACTIVITIES: The aircrew training devices for the B-2 are funded in the B-2 baseline. The aircrew training device development and procurement costs are included in the total program cost. The program is managed by the B-2 System Program Office and includes eight Weapon System Trainers (WST), two Mission Trainers (MT), and a System Support Center (SCC). There is no unnecessary duplication of effort within the Air Force or Department of Defense.

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

- Procurement

FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	To Complete	Total Program
2309800	2348403	3200362	27056430	41757295

- Milcon

FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	To Complete	Total Program
111300	56750	49500	605650	1008500

I. (U) COOPERATIVE AGREEMENTS: Not Applicable

Program Element: #0604240F
PE Title: B-2 (ATB)
Project: # N/A
Budget Activity: #3-Strategic Programs

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

EVENT	DATE	RESULTS
(U) First flight	17 Jul 89	Successful
(U) Initial Block 1 Testing	17 Jul 89-13 Jun 90	Successfully completed with no anomalies, basic flying qualities demonstrated
(U) KC-10 Aerial Refueling	8 Nov 89	Qualified for KC-10 aerial refueling
(U) AV-2 first flight	19 Oct 90	
(U) KC-135 Aerial Refueling	23 Oct 90	Qualified for KC-135 aerial refueling
(U) Start of LO Testing	30 Oct 90	AV-1 currently conducting LO flight tests.

T&E ACTIVITY (TO COMPLETION)

EVENT	DATE	REMARKS

(U) Specifics of other activity is classified Special Access Required.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604242F Project Number: N/A
PE Title: Advanced Tactical Aircraft (ATA) Budget Activity: # 4 - Tactical Programs

A. (U) RESOURCES ($ In Thousands):

Project Title: Advanced Tactical Aircraft

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
ATA	36,520	2,766	0	0	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The ATA program was to develop the next generation deep interdiction fighter to replace the F-111 from the Navy A-12 program. The USAF was to follow Navy lead in development of the aircraft and procure a variant of the A-12. The program was terminated based on the A-12 program cancellation. The USAF still requires a future deep interdiction aircraft and is evaluating alternatives.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

(U) FY 1990 Accomplishments:
- (U) Completed Concept Definition Phase begun in FY 1988
- (U) Began Navy flight test program participation/planning
- (U) Began Early Risk Reduction studies

(U) FY 1991 Planned Program:
- (U) Closeout Early Risk Reduction studies
- (U) Closeout program IAW SECDEF decision to terminate A-12 contract

(U) WORK PERFORMED BY: The government awarded the FSD contract in January 1988 to the team of McDonnell Douglas Aircraft of St. Louis, Missouri and General Dynamics of Ft. Worth, Texas.

(U) RELATED ACTIVITIES:
- (U) Program Element # 0604233N (Navy A-12)
- (U) Programmatic relationship established by 4 March 1986 MOU for Cross-Service Utilization of ATF and ATA
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense

(U) OTHER APPROPRIATION FUNDS ($ IN THOUSANDS): Not Applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604243F
PE Title: Manpower, Personnel, and Training Development

Budget Activity: #6 - Defense Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3816 Pilot Selection and Classification System (PSACS)	3,978	1,799	700	100	Cont.	TBD
3817 Base Training Systems (BTS)	101	300	221	154	Cont	TBD
3818 Maintenance Skills Tutor (MTS)	239	373	2,633	3,247	Cont	TBD
Total	4,318	2,472	3,554	3,501	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides for the engineering development of manpower, personnel, and training (MPT) technologies to improve the effectiveness of Air Force personnel selection and training programs. Specific projects will develop methods to measure an applicant's aptitudes and skills, provide effective job skill training, assess the candidates job performance, and improve the Air Force's ability to document and track "school house" and field level training. These systems will reduce the costs associated with "washouts" and retraining, invest training time and materials on candidates with a high probability of success, and reduce the on-the-job time required for proficiency in specific job skills.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 3816, Pilot Selection and Classification System (PSACS): The Air Training Command (ATC) needs the ability to select pilot candidates who have the best chance for successfully completing pilot training. Small reductions in the training attrition rate can save millions of dollars and increase the number of pilots trained each year. Further, an additional capability is needed to predict the probability of success in specific types of aircraft. This capability supports ATC's Specialized Undergraduate Pilot Training (SUPT), where basic pilot training will occur in T-37 aircraft and subsequent specialized training will occur in T-38 aircraft for Bomber-Fighter pilots and in business jet trainers for Tanker-Transport pilots. This project supports SUPT by developing and producing a specialized computerized testing device and computer-based battery of tests designed to predict which pilot candidates will be successful in training and follow-on aircraft assignment. This system consists of (initially 25) test devices (desk top computer with test software) and a test processing station (centralized computer to analyze the test data and identify pilot candidates).

Program Element: #0604243F Budget Activity: #6 - Defense Wide Mission Support
PE Title: Manpower, Personnel, and Training Development

(U) FY 1990 Accomplishments:
- (U) Awarded contract to begin full scale development of the Pilot Selection and Classification System (PSACS).
- (U) Began coding test software into Ada to improve maintainability and reduce the software's life cycle cost.

(U) FY 1991 Planned Program:
- (U) Produce 25 prototype test devices to evaluate the device's ability to predict success - compare results to previous research devices.
- (U) Integrate a validated specialized pilot training predictor into the test software.
- (U) Set up an operational support center to maintain the system and provide software support to Air Training Command (ATC).
- (U) Begin full scale development of the test processing station to compute and compile pilot applicant test data.

(U) FY 1992 Planned Program:
- (U) Complete production of the PSACS test devices, delivering 135 devices to ATC with options for 115 additional devices.
- (U) Validate structured pilot interviews (non-computer-based) for to enhance the pilot selection and classification process.
- (U) Complete development of the test processing station.

(U) FY 1993 Planned Program:
- (U) Implement enhanced pilot selection and classification algorithms.

(U) Work Performed by: Project is managed by Human Systems Division, Brooks AFB TX; contractor is CTA, Inc., Denver CO.

(U) Related Activities:
(U) PE 0602205F, Personnel, Training, and Simulation
(U) PE 0603227F, Personnel, Training, and Simulation Technology
(U) PE 0804748F, Flight Screening
(U) No unnecessary duplication of effort within AF or DoD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3817, Base Training System (BTS): New and increasingly complex weapon systems and rapidly changing technology, combined with major force reductions in personnel programs require personnel to be more efficient in the performance of their assigned duties. Thus, the Air Force will have to rely more heavily upon enlisted specialty training instead of formal school house training. Unfortunately the manpower resources allocated to training will not increase to meet these demands, therefore the only alternative is to capitalize on technology to develop a more efficient system for

Program Element: #0604243F
PE Title: Manpower, Personnel, and Training Development

Budget Activity: #6 - Defense Wide Mission Support

training management. BTS is a computerized management system for all unit level enlisted and officer training which will improve management, administration, scheduling, and record keeping.

(U) FY 1990 Accomplishments:
- (U) Concluded design and analysis of system concept options for an enlisted field training system to provide computer tracking of on-the-job training history and skill qualifications.

(U) FY 1991 Planned Program:
- (U) Conduct pre-acquisition analysis of prototype enlisted training system to evaluate system's response to user's environment.
- (U) Award contract to begin full scale development of the BTS including software modifications to ensure compatibility with AF standard computers.

(U) FY 1992 Planned Program:
- (U) Produce, install and evaluate a prototype BTS system in an operational environment.
- (U) Begin support of AF-wide implementation of a the operational BTS systems.

(U) FY 1993 Planned Program:
- (U) Award contract to produce and install operational BTS systems AF-wide.

(U) Work Performed By: Project managed by Human Systems Division, Brooks AFB TX. Contractors are McDonald Douglas Training Systems, Auroa CO, and Ball Systems Corp, Albuquerque NM.

(U) Related Activities:
(U) PE 0601102F, Defense Research Sciences
(U) PE 0602205F, Personnel, Training, and Simulation
(U) PE 0603227F, Personnel, Training and Simulation Technology
(U) PE 0603720N, Education and Training
(U) No unnecessary duplication of effort within the AF or DOD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3818, Maintenance Skills Tutor (MST): This project will develop and field computer-based training systems for the Tactical Air Forces (TAF) to improve the troubleshooting skills of flightline maintenance technicians. This training will build on their initial skills and concentrate on accelerating their on-the-job experience. Computerized tutors using artificial intelligence will train, test, and evaluate a technician's skill level and tailor the lesson to meet the training objectives and the students needs. Training will emphasize understanding and troubleshooting

Program Element: #0604243F Budget Activity: #6 - Defense Wide Mission Support
PE Title: Manpower, Personnel, and Training Development

problems that maintenance aiding equipment and systems are unable to diagnose.

(U) FY 1990 Accomplishments:
- (U) Analyzed operational and support requirements for TAF maintenance training.

(U) FY 1991 Planned Program:
- (U) Assess current computer training methodologies and technologies, especially the capability to incorporate technologies developed and demonstrated in PE 0603227F under the Basic Job Skills/Job Family Tutors research and Intelligent Tutoring Systems technology research programs.
- (U) Develop MST design options and specifications for full scale engineering development - identify which skills should be developed, their order and the level of detail which the skill should be presented to the student.
- (U) Evaluate compatibility of MST system designs with current and planned TAF computer training hardware systems - the MST system is designed to work with TAF's currently fielded computer systems.

(U) FY 1992 Planned Program:
- (U) Conduct trade-off analyses between design options to determine the optimal combinations of system capability, supportability and maintainability.
- (U) Analyze development and life-cycle cost estimates for each design option and determine most cost effective system.
- (U) Award contract to begin full scale engineering development of a series of Maintenance Skills Tutors to enhance troubleshooting skills of flightline maintenance personnel for various models and versions of the F-15 and F-16.

(U) FY 1993 Planned Program:
- (U) Conduct operational test and evaluation of the initial MST.
- (U) Continue full scale development of additional tutors for the TAF.

(U) Work Performed by: Project will be managed by Human Systems Division, Brooks AFB TX. Contractors are to be determined.

(U) Related Activities:
- (U) PE 0602205F, Personnel, Training, and Simulation
- (U) PE 0603227F, Personnel, Training, and Simulation Technology
- (U) No unnecessary duplication of effort within AF or DoD.

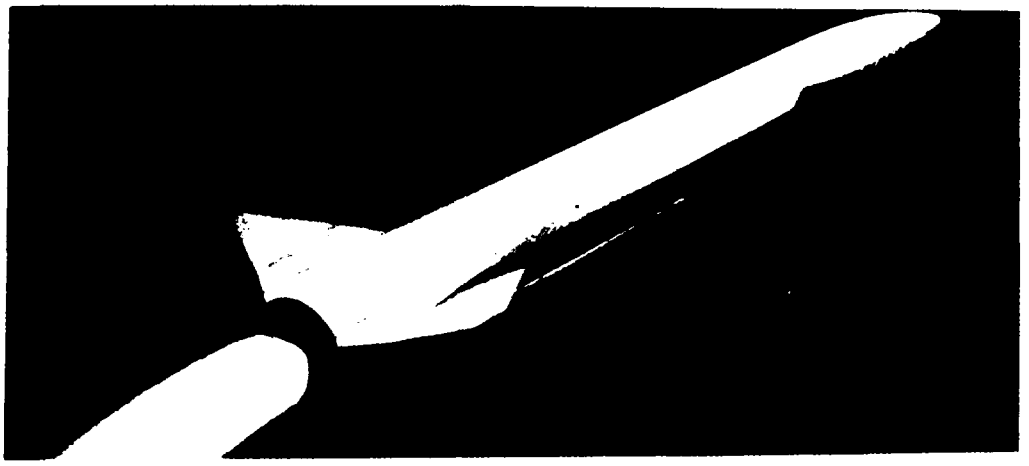
(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604244F
PE Title: SRAM II Eng Development
Project: # 3182
Budget Activity: #3 - Strategic Programs

Project Title: (SRAM II)



POPULAR NAME: SRAM II

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
($000)					
Major Contract	181,604	115,247	115,980	122,450	972,188 (82,340)
Support Contract	33	55	57	57	4,634 (57)
In-House Support	3,361	6,389	7,630	7,824	37,135 (5,526)
GFE/ Other	26,060	27,611	42,212	39,752	240,275 (32,214)
Total	211,058	149,302	165,879	170,083	1,254,232 (120,137)
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	(To Complete)
Program Milestones					MS III FY95/2 FAD FY96/1
Engineering Milestones			CDR 12/91		
T&E Milestones			1st Flight 4/92		25th Flight FY95/1
Contract Milestones			LRIP LL 2/92	LRIP 8/93	

Program Element: #0604244F
PE Title: SRAM II
Project: # 3182
Budget Activity: #3-Strategic Programs

B (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
Strategic Air Command requires an improved short range attack missile to improve the operational flexibility of our penetrating bombers by providing a single weapon to strike defended, hard and relocatable targets without having to directly overfly targets. SRAM II is a supersonic, air-to-ground nuclear weapon that severely stresses the defensive threat. The combination of supersonic speed, low observability, and variable flight profile makes SRAM II highly survivable in terminal defense zones. SRAM II significantly compounds enemy defense requirements and prevents optimization of defenses against low altitude subsonic targets. The required performance improvements relative to SRAM A are attainable with existing technology. It is not the intent of this program to stress technology to its limits, but rather to build a state-of-the-art SRAM II using available technology.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Completed the rocket motor fault tree analysis and implemented design changes to correct propellant cracking and solve insulation adequacy concerns; final Critical Design Review (CDR) delayed from May 89 to Dec 91.
   - (U) Flight tests began with aircraft integration, static ejection, and environmental and jettison tests.

2. (U) FY 1991 Planned Program:
   - (U) Complete rocket motor development testing (pre-CDR).
   - (U) Continue testing SRAM II/B-1B, including captive/integration testing.
   - (U) Continue B-2 integration and lab testing.

3. (U) FY 1992 Planned Program:
   - (U) Complete detail design prior to completion of CDR in Dec 91.
   - (U) Long-lead low rate initial production.
   - (U) Delivery and launch of first live missile.
   - (U) Complete rocket motor preliminary flight rating tests
   - (U) Complete Second Avionics Life Durability Test.

4. (U) FY 1993 Planned Program:
   - (U) Complete rocket motor qualification phase.
   - (U) Delivery of Mission Planning Software.
   - (U) Complete initial 8 DT&E test flights/launches of the missile.
   - (U) Begin low rate initial production.

5. (U) Program to Completion:
   - (U) Missile production transitions to automated production facility in Oak Ridge, Tennessee.
   - (U) Complete the 25 missile flight test program; the final 5 launches are dedicated IOT&E tests.
   - (U) Full rate production authorization (MS III)
   - (U) Completion of nuclear certification activities.

D. (U) WORK PERFORMED BY: Boeing Aerospace and Electronics, Seattle, WA is the SRAM II prime contractor. Boeing Military Airplane, Seattle WA and Rockwell International, El Segundo CA will integrate the SRAM II onto the B-1B; Northrop, Pico Rivera CA will integrate the SRAM II onto the B-2.

Program Element: #0604244F
PE Title: SRAM II
Project: # 3182
Budget Activity: #3-Strategic Programs

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: Cause and fix verified for rocket motor propellant cracking at extremely low temperatures. A chemical shield placed between the thermal barrier and pulse 2 grain prevents any propellant/barrier chemical interaction.

   (U) Cause and fix determined for case burn-through during rocket motor acceleration testing. Additional insulation secondarily bonded to the case in the pulse 1 region solves backside temperature concerns and prevents case burn-through under lateral acceleration loading. Two sled tests will be accomplished prior to CDR to verify fix.

   (U) Fault tree analysis established to determine cause(s) for cold motor firing failure during pulse 1 burn. Three high cause probability candidates identified: (a) improper thermal barrier installation, (b) thermal barrier bead pulled out with pressurization, and (c) thermal barrier rupture into an ignition induced pulse 2 grain crack. Multiple component test articles and diagnostic motor tests ongoing to determine cause(S) and fix. Replacement motor firing scheduled for April 1991.

2. (U) Schedule Changes: CDR completion delayed from December 1990 to December 1991. First Assets Delivered has been delayed until first quarter FY 96.

3. (U) Cost Changes: Increased costs due to new inflation indices, reduced total buy and the delayed flight test effort caused by the slip of CDR.

F. (U) PROGRAM DOCUMENTATION:

- (U) AFSC SCP, SECRET, 22 Feb 86
- (U) SAC SON 14-82, SECRET, 1 Mar 86
- (U) SRAM II System Specification, SECRET, 30 Mar 86
- (U) SAC SORD 14-82 II/III, SECRET, 16 Oct 86
- (U) SRAM II DCP, 2 Jun 87
- (U) SRAM II TEMP w/ANNEX,SECRET, Mar 89

G. (U) RELATED ACTIVITIES:

- (U) All missile development activities prior to FY90 are funded through the SRAM II Advanced Development program (PE #0603364)
- (U) SRAM II will be developed for internal carriage on the B-1B (PE #0604226F) and B-2 (PE #0604240F).
- (U) Funds are programmed in the B-1B program element to procure the hardware modifications to support SRAM II carriage. The SRAM II program element contains the RDT&E funds to develop the B-1B hardware modifications.
- (U) There is no duplication of effort within the Air Force or the Department of Defense.

Program Element: #0604244F
PE Title: SRAM II
Project: # 3182
Budget Activity: #3-Strategic Programs

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

- (U) SRAM Missile Procurement (BA 4201) BPAC #633182, PE #11218F (Weapon System Only) (qty: 700)
- (U) P-1 #3020, 20XX, System
- (U) P-1 #3020, 30XX, Advance Buy
- (U) P-1 #3020, 26XX, Spares

	FY1990 Actual	FY1991 Estimate	FY1992 Estimate	FY1993 Estimate	To Compl	Total Pgm
20XX	4.3	10.1	11.0	81.0	757.6	864.0
30XX	6.4	0.0	0.0	6.4	64.1	76.9
26XX				1.2	25.5	26.7
Total	10.7	10.1	11.0	88.6	847.2	967.6

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
Functional check flight of aircraft configured for SRAM II carriage and launch	18 Oct 89	Successful integration
Completed static ejection tests from aft and mid weapons bays of B-1B	20 Oct 89 - 6 Sep 90	Successful ground demonstration of safe separation, and acceptable missile and warhead reaction
Completed vibration, acoustics and loads tests in aft and mid B-1B weapons bays	29 Nov 89 - 30 Aug 90	Verified acceptable response from missile, warhead and B-1B to dynamic environments
Completed inflight jettison tests from mid weapons bay of B-1B	20 Dec 89 - 25 Sep 90	Verified acceptable missile jettison and safe separation characteristics from B-1B
Completed six inflight jettison tests from aft B-1B weapons bay	25 Jan 90 - 29 Nov 90	Verifying acceptable missile jettison and safe separation characteristics from B-1B
Completed three captive carry integration tests	13 Nov 90 - 11 Dec 90	Verifying proper integration of missile and B-1B hardware and software

Program Element: #0604244F
PE Title: SRAM II
Project: # 3182
Budget Activity: #3-Strategic Programs

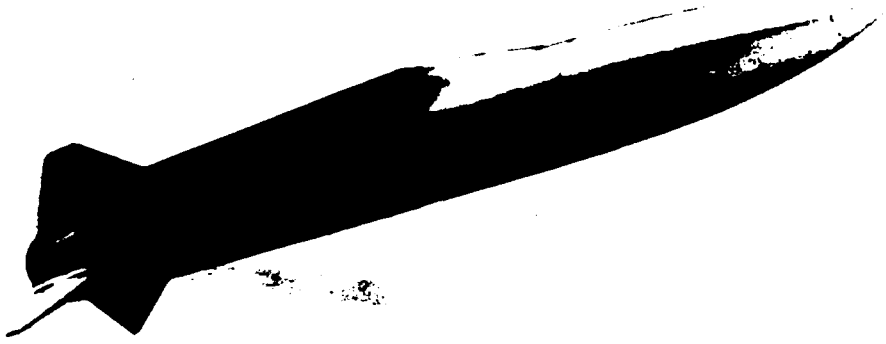
T&E ACTIVITY (TO COMPLETION)

Event	Date	Purpose
Complete aft bay jettison testing	May 91	Verify acceptable missile jettison and separation characteristics from B-1B
Complete captive carry integration testing	Jul 91	Verify proper integration of missile and B-1B hardware and software
Complete jettison and environment testing from forward weapons bay of B-1B	Aug 91	Verify acceptable integration of missile in any B-1B weapons bay
First SRAM II Live Launch	Apr 92	
25th SRAM II Live Launch	Jan 95	Last dedicated IOT&E launch. Supports production milestone.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604245F
PE Title: SRAM T Eng. Dev.
Project: 3951
Budget Activity: #4-Tactical Programs

Project Title: Short Range Attack Missile - Tactical



POPULAR NAME: SRAM T

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands):

BUDGET	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
($000)					
Major Contract	48,759	22,000	28,000	81,000	TBD Program in Restructure *
Support Contract					
In-House Support	140	200	980	2,300	TBD*
GFE/ Other	5,296	5,600	5,366	23,220	TBD*
Total	54,195	27,800	34,346	106,520	382,732 (159,871)
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	(To Complete)
Program Milestones	MS II 11/89				MS III FY96/4 FAD FY98/2
Engineering Milestones			PDR 1/92 CDR 3/93		
T&E Milestones		EVT/A Completion		Captive Carry 5/94	Flt Test Compl FY96/2
Contract Milestones	FSD 4/90				Production FY97/2

* Due to funding reductions in FY91 and FY92 the program is being restructured. Final contract and other costs are not available as of this date.

Program Element: #0604245F Project: XXX1
PE Title: SRAM T Budget Activity: #4-Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The Short Range Attack Missile - Tactical (SRAM T) is a first generation tactical nuclear air-delivered missile capable of penetrating known air defenses to strike the full range of targets. The need for SRAM T is based on an operational deficiency: there are no tactical standoff nuclear weapons for Tactical Air Force, Navy or NATO dual capable aircraft. A modified Short Range Attack Missile II (SRAM II) offers the least costly, most timely and lowest risk option for meeting the tactical nuclear stand-off weapon requirement. This modified SRAM II has been designated SRAM T. Its extended range will enable aircraft to avoid enemy air defenses at or beyond the forward line of troops, as well as stand-off from terminal area target defenses. Its combination of supersonic speed, low observability and variable flight profiles will make the SRAM T a highly survivable weapon, significantly compounding enemy defense requirements. The required SRAM T performance modifications are attainable with existing technology.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) SRAM T missile development contract awarded 3 April 1990
   - (U) F-15E integration contract awarded 16 July 1990
   - (U) Warhead Phase 3 (full-scale development) initiated by DOE, 31 July 1990
   - (U) Initiated F-15 pylon adapter development
   - (U) Initiated missile and aircraft computer software development
   - (U) Deliver vibration fly around test missile to Edwards AFB

2. (U) FY 1991 Planned Program:
   - (U) Conduct F-15E aircraft integration Preliminary Design Review (PDR), early vibration fly around and wind tunnel testing
   - (U) Begin engineering for test flight missile payloads with DOE
   - (U) Conduct warhead support equipment and training development
   - (U) Conduct logistic support planning
   - (U) Begin fabrication of SRAM T ground test missiles and F-15E adapter hardware

3. (U) FY 1992 Planned Program:
   - (U) Conduct missile PDR, support equipment and aircraft integration effort, Jan 1992
   - (U) Complete AF/DOE test warhead telemetry development activity
   - (U) Complete fabrication/delivery of SRAM T ground test missile
   - (U) Continue development of missile and aircraft test sets
   - (U) Deliver carrier/missile software, hardware and simulator to aircraft integration contractor

Program Element: #0604245F Project: XXX1
PE Title: SRAM T Budget Activity: #4-Tactical Programs

4. (U) FY 1993 Planned Program:
   - (U) Conduct critical design reviews on the tactical missile, support equipment and aircraft integration effort, June 1992
   - (U) Complete development, test and deliver aircraft pylon adapter and operational flight software (OFS) to Edwards AFB
   - (U) Deliver ground test missiles to Edwards AFB
   - (U) Initiate separation and captive carry flight test program on the F-15E
   - (U) Procure components and fabricate flight test payloads
   - (U) Initiate fabrication of live launch test missiles
   - (U) Procure flight test missile avionics, flight control system and other components
   - (U) Start assembly and checkout of flight test missiles
   - (U) Conduct system integration lab tests of the missile and warhead components
   - (U) Continue warhead design and integration activities
   - (U) Complete peculiar support equipment and software development
   - (U) Design and fabricate prototype mechanical support equipment
   - (U) Conduct logistics support analysis and technical order development activities
   - (U) Continue the nuclear certification process

5. (U) Program to Completion:
   - (U) Conduct DT&E/IOT&E live launches
   - (U) Begin SRAM T long lead production procurement
   - (U) Begin SRAM T full rate production based upon successful completion of 21 development and initial operational test launches (D/IOT&E) on the F-15E
   - (U) Complete SRAM T/F-15E Nuclear Certification program

D. (U) WORK PERFORMED BY: Boeing Aerospace and Electronics, Seattle, WA will modify SRAM II for the tactical mission and McDonnell Douglas Aircraft Company, St. Louis, MO will integrate SRAM T on the F-15E

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: See SRAM II (PE #0604244F) Descriptive Summary.

2. (U) SCHEDULE CHANGES: F-15E integration contract award delay, and SRAM II technical problems in the SRAM II program caused a slip in the SRAM-T program.

3. (U) COST CHANGES: Cost changes reflect the recent program restructure.

F. (U) PROGRAM DOCUMENTATION:

- (U) System Threat Assessment Report (STAR), SECRET-NF-WN, 14 Jul 89
- (U) TAF SORD 306-86-I-A, SECRET, 8 Aug 89
- (U) SRAM T DCP, SECRET, 20 Sep 89
- (U) SRAM T Acquisition Strategy Report, 7 Nov 89
- (U) SRAM T TEMP, SECRET, 16 Nov 89
- (U) USA(A) ADM, 30 Nov 89

Program Element: #0604245F Project: XXX1
PE Title: SRAM T Budget Activity: #4-Tactical Programs

G. (U) RELATED ACTIVITIES:

- (U) The parent SRAM II design is being developed under the SRAM II Engineering Development program, PE #0604244F
- (U) There is no duplication of effort within the Air Force or the Department of Defense

H. (U) OTHER APPROPRIATION FUNDS:

- (U) F-15E modification production funding (3010), PE #0207134F, will be included in the SRAM T program in the "to complete" data.
- (U) Engineering to build an adaptor to hang the missile in the WS^3 (3080), PE #0208030, is contained within the SRAM T program in the FY92 and FY93 data
- (U) SRAM Missile Procurement (BA 4201) BPAC #633182, PE #11218F (Weapon System Only) (qty: 565)
- (U) SEEK EAGLE PE #27590F (Weapon System Only) (qty: 16)
- (U) There is no duplication of effort within the Air Force or the Department of Defense

	FY1990 Actual	FY1991 Estimate	FY1992 Estimate	FY1993 Estimate	To Complete	Total Program
WS3	0.0	0.0	0.4	0.2	0.0	0.6
Procurement	0.0	0.0	0.0	0.0	832.9	832.9

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

- (U) The United Kingdom (UK) is interested in developing/ purchasing a nuclear tactical air-to-surface missile (TASM). The United States and UK have signed a Memorandum of Understanding for the exchange of SRAM II data to facilitate a UK feasibility study of this potential TASM solution.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (Past 36 Months)

- (U) 110 hours of F-15E/SRAM T wind tunnel testing have been completed to determine preliminary interface loads and store separation characteristics
- (U) Wind tunnel test complete
- (U) Initiated vibration fly-around testing in Nov 90

T&E ACTIVITY (To Completion)

- (U) 500 hours of F-15E/SRAM T wind tunnel testing is planned in FY91 and FY92 to determine store loads and separation characteristics for various operational configurations
- (U) Ground testing of a SRAM T on an F-15E will be conducted at Edwards AFB beginning in FY93
- (U) Combined DT&E/IOT&E testing will be complete in the 3rd quarter of FY96

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604247F Budget Activity: #4 - Tactical Programs
PE Title: Modular Automated Test Equipment (MATE)

A. (U) RESOURCES ($ in thousands)

Project Number & Title	FY 1990 Actuals	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
0001 Integrated Diagnostics		1,500	00,000	00,000	00,000	1,500
2503 MATE	9,721	9,430	00,000	00,0000	00,000	151,900
3080 Generic Integrated Maintenance Diagnostics (GIMADS)	3,978	2,000	00,000	00,000	00,000	23,600
Total	13,699	12,930	00,000	00,000	00,000	177,000

B. (U) BRIEF DESCRIPTION OF ELEMENT: The rapid growth of devices, equipment and systems necessitates substantially greater dependency on test, diagnosis and health assessment not only during manufacturing but also throughout the life cycle of each product. A large fraction (25-30 percent) of a weapon system's life cycle cost is currently spent for maintenance. Approximately 50 percent of this maintenance cost comes form the diagnostic process of locating problems and identify potential solutions. This program element has been revised and restructured to further the development of standardized, integrated diagnostics process and equipment. These revisions show the evolution of the MATE program from a hardware specific program to a flexible program for insertion of new technologies/software concepts into the integrated diagnostics domain. The GIMADS project (3080) comes to closure as scheduled in FY 1991. This project demonstrated generic, expandable, integrated maintenance diagnostic methods on fielded weapon systems; and resulted in significant revision to Air Force Guide Specifications. The MATE project (2503) has been restructured, based on OSD guidance, to focus on software advances in developing diagnostic programs in the Ada language. A new project 0001 has been developed to take advantage of new capabilities developed under PE #0604247F as well as Army and Navy developed diagnostics capabilities.

C. (U) JUSTIFICATION FOR PROJECT LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

(U) Project 3080, GIMADS: Provides generic, expandable, integrated maintenance diagnostics methods with early demonstration of GIMADS application on fielded weapon system upgrades.

(U) FY 1990 Accomplishments:

- (U) Completed technology investigation tasks in current problems, future needs, human factors design, maintenance aids, and mechanical systems.
- (U) Continued technical investigation tasks
- (U) Significant revisions/improvements to the GIMADS Air Force Guide Specifications (AFGS) and the Mil-Standard (Mil-Std) Specification.

Program Element: #0604247F Budget Activity: #4 - Tactical Programs
PE Title: Modular Automated Test Equipment (MATE)

(U) FY 1991 Planned Program:
- (U) Update GIMADS AFGS and Mil-Std Specification with requirements derived from technology tasks.
- (U) GIMADS AFGS and Mil-Std 95% complete
- (U) Issue interim AFGS and Mil-Std

(U) Work Performed By: The GIMADS Program is managed by the GIMADS Program Office of the Aeronautical Systems Division at Wright-Patterson AFB, Ohio. The primary contractor for GIMADS is General Dynamics, Ft Worth Division, Ft Worth, Texas. Other contractors on the GIMADS contractor team are General Dynamics (Electronic Division), Hughes Aircraft Company, Technology Inc., Rockwell International, Giordano Associates, General Electric Company, TRW, and Bell Helicopter.

(U) Related Activities:

- (U) Close cooperation is maintained with other services via the DOD/Industry Forum held annually. GIMADS is supported with recommendations by the DOD/Industry Forum consisting of approximately 150 companies formed as a subgroup of the Integrated Diagnostics Working Group of the National Security Industrial Association.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: None.

(U) Project 0001, Integrated Diagnostics: Foster standardized development, improvement, and use of integrated diagnostic processes by focusing weapon industry on effective, low cost, timely solutions to Air Force diagnostic requirements.

(U) FY 1991 Planned Program:

- (U) Apply artificial intelligence techniques to automated tools for developing statements of work tasks.
- (U) Begin development of tools and techniques to support integrated diagnostics for weapon system software.
- (U) Pursue the development by the IEEE of a set of industry standards that bring the advantages of the DoD standard programing language (Ada) into the integrated diagnostics process.
- (U) Continue developing the technique that will achieve hardware independence of the test program sets.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604247F Project Number: 2503
PE Title: Modular Automated Test Equipment (MATE) Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in thousands)

Project Title Popular	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
MATE	9,721	9,430	00,000	00,000	00,000	151,900

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
Previous Air Force methods used in acquiring Automatic Test Systems (ATS) have caused a proliferation of unique equipment (over 500 different systems) resulting in specialized training, technical manuals and spares, as well as low operational reliability, supportability, weapon system interoperability and large life cycle costs. A major reason why aircraft availability (force readiness) is often below desired levels is because of malfunctioning and unsupportable ATS at all levels of maintenance. The MATE program has developed a methodology which delineates a standard modular architecture and a management system for acquisition and support of all future Air Force ATS. In addition, an Air Force owned MATE Operations Center has been developed to distribute the MATE hardware and software standards, perform verification testing on proposed MATE modules, maintain and distribute government furnished MATE Control and Support Software (MCSS), and provide a center of MATE expertise for government and industry.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:

-(U) Organized and chaired the ABET working group
-(U) Completed PCA of MCSS version 5.1
-(U) Completed RF Testing Trade Study
-(U) Completed ATLAS/CIIL Tracking Microtool
-(U) Completed MCSS version 5.1 CIIL standard
-(U) On-going applications support
-(U) Completed MCSS 7.0 CDR
-(U) Completed MATE Effectiveness Study

2. (U) FY 1991 Planned Program:

-(U) Preliminary ABET interface standards for instrument control
-(U) Preliminary ABET test description language standard

Program Element: #0604247F Budget Activity: #4 - Tactical Programs
PE Title: Air Force Centralized Integrated Diagnostics

-(U) OSIM version 6.0 MCSS release
-(U) OSIM specification completed
-(U) CIIL specification for MCSS versions 6.0 and 7.0 completed
-(U) Update IAC standard to VXI 1.3
-(U) Complete OSIM Application Handbook
-(U) Continue Application Support
-(U) Develop 2167 documentation for MCSS versions 6.0 and 7.0
-(U) Release MCSS version 5.2
-(U) Release MCSS version 7.0
-(U) Application Tracking Microtool complete

D. (U) WORK PERFORMED BY: The MATE Program is managed by the Support Equipment Systems Program Office of the Aeronautical Systems Division at Wright-Patterson AFB, Ohio. The MATE Operations Center is manned and controlled by the Automated Test Systems Division at the San Antonio Air Logistics Center, Kelly AFB, Texas. The MATE integrating contractor for new technology insertion is SOFTECH, Alexandria, Virginia. A new integration contractor will be selected for award in FY 1992. MATE is also supported with recommendations by the MATE Users Group (MUG) composed of approximately 100 companies formed as a subgroup of the Automatic Testing Committee of the National Security Industrial Association.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: Funding was suspended.

F. (U) PROGRAM DOCUMENTATION:

- (U) Mission Element Need Statement - USATRADOC ACN 22358 - 13 Aug 1979
- (U) MATE PMD 7098 (10)/64247F - 19 Mar 1987
- (U) MATE TEMP - May 1981
- (U) AFSC/AFLC Regulation 800-23, MATE, 25 Jan 1984
- (U) SAF/RL MATE Air Force Policy Letter for Commanders - 1 Jul 1987

G. (U) RELATED ACTIVITIES:

- (U) Joint Logistics Commanders (JLC) Panel on Automatic Testing
- (U) Navy Consolidated Automated Support System (CASS) Program
- (U) Army Intermediate Forward Test Equipment (IFTE) Program
- (U) Industry MATE Users Group (MUG), subgroup of the Automatic Testing

Program Element: #0604247 Budget Activity: #4 - Tactical Programs
PE Title: Air Force Centralized Integrated Diagnostics

Committee of the National Security Industrial Association
- (U) A-10 Intermediate Automatic Test Station (IATS), Program Element #0207131F (A-10 Squadrons)
- (U) B-1B Depot Automatic Test System for Avionics (DATSA), Program Element #0101126F (B-1B Squadrons)
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense

H. (U) OTHER APPROPRIATION FUNDS:

1. (U) PROCUREMENT: Not Applicable.
2. (U) MILITARY CONSTRUCTION: Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE:

1.	(U) MATE Full Scale Development Phase I Completed	Sep 1985
2.	(U) MATE Operations Center Full Operational Capability	Dec 1987
3.	(U) Release of Instrument on a Card Standard	Jun 1988
4.	(U) Unit Under Test (UUT) Simulator Completed	Nov 1988
5.	(U) Unit Under Test (UUT) Simulator Completed	Nov 1988
6.	(U) Program Management Transfer of MATE 5.0 software	Dec 1988
7.	(U) Simulation Data Format Standard Completed	May 1989
8.	(U) Downsized Tester Guidance Completed	Jun 1989
9.	(U) Restructure MATE Guides Completed	Jul 1989
10.	(U) Ada Design Activity Begins	Aug 1989
11.	(U) Begin Development of Automated MATE Guides	Oct 1989
12.	(U) Release MATE Software Version 5.1	Sep 1990
13.	(U) Release MCSS Versions 5.2, 6.0 & 7.0	FY 1991
14.	(U) Issue ID PMD	FY 1991
15.	(U) Initiate Development of Test Program Set (TPS) Development Environment	FY 1991

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604249F Budget Activity: #4 - Tactical Programs
PE Title: Night/Precision Attack

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2693 LANTIRN	3,483	1,677	1,960	1,803	1,493	533,510
3920 Night Attack Program	6,430	5,946	24,679	26,241	41,873	105,169
Total	9,913	7,623	26,639	28,044	43,366	638,679

B. (U) BRIEF DESCRIPTION OF ELEMENT: PE contains two separate efforts which contribute to Air Force capabilities to conduct successful interdiction and Close Air Support/Battlefield Air Interdiction (CAS/BAI) missions at night. Funding under Project No. 2693 completes the development and testing of the ongoing Low Altitude Navigation and Targeting Infrared system for Night (LANTIRN) on production F-15E and F-16 Block 40/42 aircraft. The Night Attack Program (NAP), Project No. 3920, was an FY 1990 new start to develop, test, and evaluate Forward Looking Infrared (FLIR) and image intensifier systems to enhance night capabilities for follow-on CAS/BAI aircraft.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2693, LANTIRN: The need for LANTIRN is documented in Tactical Air Forces' Statement of Operational Need 302-81, Night Attack Capabilities. LANTIRN responds to that need by providing the capability to conduct close air support and interdiction missions at night and under-the-weather for F-15E and F-16C/D fighter aircraft. LANTIRN provides the capability not only to attack at night, but also to attack with precision laser guided weapons day or night and in conditions of limited visibility. The LANTIRN program includes development and testing of a wide angle raster head-up display, a navigation pod, and a targeting pod. The navigation pod contains a terrain following radar and a fixed forward looking infrared (FLIR) sensor; the targeting pod contains a gimballed FLIR, a laser designator, an automatic tracker, a missile boresight correlator, and growth provisions for an automatic target recognizer.

(U) FY 1990 Accomplishments:
- (U) Continued integration and development flight testing of LANTIRN/ F-15E and the F-16 Block 40/42 production aircraft.
- (U) Continued production of both the navigation and targeting pods.

Program Element: #0604249F Budget Activity: #4 - Tactical Programs
PE Title: Night/Precision Attack

(U) FY 1991 Planned Program:
- (U) Complete integration and development flight testing of LANTIRN/ F-15E and the F-16 Block 40/42 production aircraft.
- (U) Develop and flight test software changes resulting from initial operational use of the targeting pod.

(U) FY 1992 Planned Program:
- (U) Determine "hardening" techniques that will reduce Electro-optical Counter Measures (EOCM) susceptibility to the LANTIRN system.
- (U) Identify corrective actions to discrepancies identified in field service reports.
- (U) Flight test software changes resulting from anticipated changes in the F-16 and F-15E software suites.

(U) FY 1993 Planned Program:
- (U) Flight test software changes resulting from anticipated changes in the F-16 and F-15E software suites.

(U) Work Performed By: The LANTIRN program office is located at Aeronautical Systems Division, Wright-Patterson AFB OH. The LANTIRN prime contractor is Martin Marietta, Orlando FL. Major subcontractors include Texas Instruments, Dallas TX, for the terrain following radar; Delco Systems Operations, Goleta CA for the advanced pod control computer; Litton Laser Systems, Apopka FL for the laser designator ranger; Litton Poly-Scientific, Blacksbury VA for the dual slip ring and rotary fluid joint; and Sunstrand Power Systems, San Diego CA for the environmental control unit. F-16/LANTIRN integration work is being performed by the General Dynamics Corp., Ft. Worth TX. F-15E/LANTIRN integration work is being performed by the McDonnel Douglas Corp., St Louis MO.

(U) Related Activities:
(U) Program Element 0207133F, F-16 Squadrons.
(U) Program Element 0207134F, F-15E Squadrons.
(U) Program Element 0207249F, LANTIRN Procurement
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):

(U) Aircraft Procurement (BA 07, P-1 70):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	265,500	192,000	5,300	3,200	1,000	3,289,100
Qty						
Nav Pods	0	0	0	0	0	561
Tgt Pods	120	65	0	0	0	506

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604249F
PE Title: Night Precision Attack
Project Number: # 3920
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

Popular Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Night Attack Program	6,430	5,946	24,679	26,241	41,873	105,169

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The need for enhanced night attack capabilities is documented in TAF SON 312-88 (10 May 89) and TAF SORD 312-88-1/11/111-A (3 Jan 90) for a Follow-on Close Air Support (CAS) aircraft. The Night Attack Program (NAP) will develop, test and integrate a Head Steered Forward Looking InfraRed (FLIR) system (HSF) for retrofit into the F-16. The program will develop and integrate HSF systems, Helmet Mounted Displays (HMD) and a fixed low light level TV. Based on the outcome of the MS IV CAS Defense Acquisition Board (DAB), the program will procure night attack systems for retrofit into the production block 30 F-16 aircraft.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Identified trade-offs between head-steered and fixed FLIR systems.
   - (U) Investigated improvements to existing FLIR technology.
   - (U) Investigated HMD/Helmet Mounted Sight (HMS) and head position sensing systems.
   - (U) Evaluated automatic Maverick missile handoff techniques for the CAS/BAI mission.
   - (U) Evaluated NVG technology and its performance as a situation awareness aid.

2. (U) FY 1991 Planned Program:
   - (U) RFP for HSF/HMD system will be released (March 1991) and source selection conducted (see section C-3).
   - (U) Pilot Vehicle Interface (PVI) issues concerning the Night Attack Program will continue to be studied.
   - (U) Initial design efforts for the group A equipment for the HSF/HMD system in the F-16 aircraft.
     -- (U) Structural considerations to fit FLIR into nose of aircraft.
     -- (U) Cockpit modifications to accommodate FLIR/HMD additions.
     -- (U) Environmental control system redesign to accommodate HSF/HMD system.
     -- (U) Core computer avionics modifications required to support HSF/HMD system (hardware and software)

Program Element: # 0604249F
PE Title: Night Precision Attack
Project Number: # 3920
Budget Activity: #4 - Tactical Programs

-- (U) Technical milestones: system requirements review, system design review, subsystem preliminary design review.

- (U) Contractor develops three contract change proposals to support Full-Scale Development (FSD) and production long lead efforts.
- (U) Conduct source selection for HSF and HMD

3. (U) FY 1992 Planned Program:
   - (U) Award contract for development/definition phase.
   - (U) Start FSD for an HSF/HMD system.
   - (U) Conduct Preliminary Design Review (PDR) for subsystem and aircraft.
   - (U) Fabricate laboratory HSF/HMD mock-up units.
   - (U) HMD ejection compatibility testing.
   - (U) Conduct LLLTV demonstrations.

4. (U) FY 1993 Planned Program:
   - (U) Continue FSD for HSF/HMD system.
   - (U) Authorize contract for Development/Integration phase.
   - (U) Authorize contract for long lead and full production go ahead for HMD and HSF.
   - (U) Conduct Critical Design Review (CDR) for subsystem and aircraft
   - (U) Conduct Production Readiness Review (PRR)

5. (U) Program to Completion:
   - (U) FSD will continue into FY 1996 with first delivery of an HSF/HMD system in June 1996.

D. (U) WORK PERFORMED BY: General Dynamics, Ft Worth TX, under contract to the F-16 program office, Aeronautical Systems Division, Wright-Patterson AFB OH. GD will competitively select subcontractors during source selection in FY 1991.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Not Applicable. The Night Attack program identified in the FY 1991 descriptive summary was a demonstration program only. This descriptive summary establishes the baseline for technical development.
2. (U) SCHEDULE CHANGES: Not Applicable. This document establishes the baseline for milestone schedule events.
3. (U) COST CHANGES: FY 1992 cost change consisted of an increase in RDT&E of $0.8M from inflation. Funds were added in FY 1994 and FY 1995 for the development of a fully integrated night attack system. Procurement funds were increased in FY 1994 through FY 1997 to accommodate procurement of the system for the F-16.

F. (U) PROGRAM DOCUMENTATION:
- (U) PMD 9257(2)/64249F/27437F, 27 Feb 90.
- (U) TAF SON 312-88, 10 May 89.
- (U) TAF SORD 312-88-I/II/III-4, 3 Jan 90.

Program Element: # 0604249F
PE Title: Night Precision Attack
Project Number: # 3920
Budget Activity: #4 - Tactical Programs

G. (U) RELATED ACTIVITIES:
- (U) PE 0207131F, A-10 Squadrons.
- (U) PE 0207133F, F-16 Squadrons.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

- (U) Procurement (BA)*:

FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
--	--	--	7,099	TBD	TBD

* Funding supporting a production decision in the FYDP is included under PE 0207437F in the BP 1900 (POD account).

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE

1.	(U) SRR	Mar 91
2.	(U) Source Selection	Jun 91
3.	(U) Start FSD	Mar 92
4.	(U) Start Development/Integration	Mar 93
5.	(U) Long Lead Production authorization	Apr 93
6.	(U) First Production Unit	Jun 96

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604250F Budget Activity: #4 - Tactical Programs
PE Title: Integrated Electronic Warfare/Communications Navigation Identification (EW/CNI) Development

A. (U) Resources ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3389	Integrated Electronic Warfare System (INEWS) Pre-FSD					
	59,800	900	0	0	0	145,048
3393 Pre-FSD	Integrated Communications, Navigation, Identification Avionics (ICNIA)					
	20,875	4,270	0	0	0	57,434
3786	Integrated Communications Security (COMSEC)					
	15,531	4,850	0	0	0	31,776
3858	SEEK SPARTAN					
	5,009	0	0	0	0	5,009
Total	101,215	10,020	0	0	0	239,258

B. (U) BRIEF DESCRIPTION OF ELEMENT: This element funds advanced avionics development programs with specific application to the Advanced Tactical Aircraft (ATF), the Army Lightweight Helicopter, the Advanced Tactical Aircraft and the integration of these technologies into existing aircraft. The INEWS/ICNIA program supports a modular architecture made up of advanced technologies to provide high information processing, built-in diagnostics, modular packaging techniques and fault tolerant design. The INEWS/ICNIA pre-FSD and COMSEC tasks directly support the ATF program by developing and delivering clusters of Advanced Development Model (ADM) modules which will be incorporated into prototype ATF integrated avionics suite. During ATF FSD, these modules will be developed into JIAWG compliant modules for use in the Common Avionics Baseline architecture. The INEWS, ICNIA and COMSEC advanced architecture, advanced development modules and algorithms will be incorporated into the Full Scale Development of the integrated avionics architecture on the ATF. The SEEK SPARTAN task will investigate the integration of INEWS technologies and Joint Integrated Avionics Working Group (JIAWG) standards to meet functional requirements of existing operational tactical aircraft.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 3389 INEWS Pre-FSD: Develops modular, integrated threat warning and countermeasure functions as part of advanced integrated avionics suites. Provides self-protection capabilities that include advanced receivers and signal processors, VHSIC based data processing and management system, advanced expendables and low observable apertures.

Program Element: #0604250F Budget Activity: #4 - Tactical Programs
PE Title: Integrated Electronic Warfare/Communications Navigation Identification (EW/CNI) Development

(U) FY 1990 Accomplishments:
- (U) Completed Pre-FSD tasks.
- (U) Supported demonstrations as part of ATF integrated avionics ground prototypes.
- (U) Completed flight demonstrations of multi-spectral warning functions.
- (U) Completed expanded analysis of NATF integrated EC functional requirements.

(U) FY 1991 Planned Program:
- (U) Complete data analysis and reporting.
- (U) Close out project.

(U) FY 1992 Planned Program: Not Applicable.

(U) FY 1993 Planned Program: Not Applicable.

(U) Related Activities:
(U) Program Element #0603109F, INEWS/ICNIA.
(U) Program Element #0603109N, Navy Unique Application of INEWS/ICNIA.
(U) Program Element #0603270F, Electronic Warfare Technology.
(U) Program Element #0603230F, Advanced Tactical Fighter (ATF).
(U) Program Element #0603728F, Advanced Computer Technology.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

2. (U) Project 3393 ICNIA Pre-FSD: Transitions tri-service ICNIA development program results funded under PE 0603109F to FSD. The Common Module Program builds on ICNIA technology to define a set of modules which can efficiently implement diverse CNI requirements for multiple aircraft and which are compatible with the overall integrated architecture.

(U) FY 1990 Accomplishments:
- (U) Continued Common Module Program with delivery of initial module specification
- (U) Continued JIAWG risk reduction and computer modeling efforts in software tool evaluation, high fidelity simulation and critical component manufacturing technology.

(U) FY 1991 Planned Program:
- (U) Complete Common Module Program with delivery of initial module specification
- (U) Complete FY 90 efforts.
- (U) Close out project.

(U) FY 1992 Planned Program: Not Applicable.

Program Element: #0604250F Budget Activity: #4 - Tactical Programs
PE Title: Integrated Electronic Warfare/Communications Navigation Identification (EW/CNI) Development

(U) FY 1993 Planned Program: Not Applicable.

(U) Work Performed By: In-house work by the ATF System Program Office and Wright Development Center, Wright Patterson AFB, OH. Major contractors are TRW Corp., San Diego CA and Rockwell-Collins, Cedar Rapids IA.

(U) Related Activities:
- (U) Program Element #0603109F, INEWS/ICNIA.
- (U) Program Element #0603109N, Navy Unique Application of INEWS/ICNIA.
- (U) Program Element #0603270F, Electronic Warfare Technology.
- (U) Program Element #0603230F, Advanced Tactical Fighter (ATF).
- (U) Program Element #0603728F, Advanced Computer Technology.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3786 Integrated Communications Security: A lead service funded, NSA managed effort to develop and demonstrate an Advanced Avionics COMSEC Unit (AACU). The AACU will be a VHSIC based JIAWG compliant module implementing the information security (INFOSEC) encryption/decryption algorithms for secure transmission, reception, storage and processing of classified information and signals.

(U) FY 1990 Accomplishments:
- (U) Continued AACU development.
- (U) Delivered breadboard units for initial integrated avionics prototype integration.
- (U) Incorporated AACU design in JIAWG gate-level system simulation program to develop tools for interfacing the AACU with multiple aircraft avionics suites.

(U) FY 1991 Planned Program:
- (U) Complete initial AACU development.
- (U) Formalize JIAWG definition of common COMSEC interfaces and AACU standard.
- (U) Finalize security risk assessments and NSA review of weapon system INFOSEC designs.
- (U) Close out project.

(U) FY 1992 Planned Program: Not Applicable.

Program Element: #0604250F Budget Activity: #4 - Tactical Programs
PE Title: Integrated Electronic Warfare/Communications Navigation Identification (EW/CNI) Development

(U) FY 1993 Planned Program: Not Applicable.

(U) Work Performed By: In-house work by NSA. Major contractors are TRW Corp., San Diego CA and Motorola, Scottsdale, AZ.

(U) Related Activities:
- (U) Program Element #0603109F, INEWS/ICNIA.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 3858 SEEK SPARTAN: Missile and laser warning systems are required to effectively reduce aircraft combat attritions within mission areas that contain threats of increasing complexity and numbers. Current missile warning systems are inadequate and rely on visual acquisition of the missile. The SEEK SPARTAN project develops and integrates missile and laser warning system technologies for current generation/operational tactical aircraft. SEEK SPARTAN will apply JIAWG form, fit and functional standards to facilitate modular avionics commonality and multi-aircraft applications.

(U) FY 1990 Accomplishments:
- (U) Refined system requirements through analysis of threat and aircraft mission.
- (U) Completed integration feasibility studies, including installation concept and risk assessment, installed performance and associated life cycle cost estimates.
- (U) Began thermal risk reduction task for two candidate platforms to establish risk associated with using liquid cooled modules in an air-cooled environment.

(U) FY 1991 PLANNED PROGRAM:
- (U) Complete thermal risk reduction effort.
- (U) Close out project.

(U) FY 1992 PLANNED PROGRAM: Not Applicable.

(U) FY 1993 PLANNED PROGRAM: Not Applicable.

(U) Work Performed By: In-house work conducted by Aeronautical Systems Division and the Air Force Electronic Combat Office, Wright-Patterson AFB, OH.

Program Element: #0604250F Budget Activity: #4 - Tactical Programs
PE Title: Integrated Electronic Warfare/Communications Navigation Identification (EW/CNI) Development

(U) RELATED ACTIVITIES:
- (U) Program Element #0603109F, INEWS/ICNIA
- (U) Program Element #0603109N, Navy Unique Application of INEWS/ICNIA
- (U) Program Element #0603270F, Electronic Warfare Technology
- (U) Program Element #0603230F, Advanced Tactical Fighter
- (U) Joint Integrated Avionics Working Group (JIAWG)
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) OTHER APPROPRIATION FUNDS ($ in Thousands): Not Applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604268F
PE Title: Aircraft Engine Component Improvement Program (CIP)
Project Number: N/A
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

Project Title: Aircraft Engine Component Improvement Program (CIP)

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Aircraft Engine CIP	75,405	90,230	114,101	117,740	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: CIP provides critical sustaining engineering support (only source) for in-service Air Force engines to maintain flight safety (highest priority), to correct service revealed deficiencies, to improve system Operational Readiness (OR) and Reliability and Maintainability (R&M), to reduce engine Life Cycle Cost (LCC), and to keep older engines operational. Historically, aircraft systems change missions, tactics, and environments to meet changing threats throughout their lives. Numerous new problems can arise through actual use during deployment, production, and service; and CIP provides the only funds to develop fixes for these field problems. CIP starts with acceptance of the first production engine and continues over the engine's life, gradually decreasing to a minimum level (safety/depot repairs) sufficient to keep older inventory engines operational. CIP addresses usage and life not covered by engine warranty and enables the Air Force to obtain improved warranties when manufacturers incorporate CIP improvements into production engines. Since changes continue throughout a system's operational life, CIP must be maintained at a level to provide the engineering support to make changes which are essential for satisfactory system performance at affordable costs. CIP ensures continued improvements in engine R&M factors, which reduces the size of outyear support costs. Typically, CIP efforts reduce outyear Operations and Maintenance (O&M) and spares costs by a ratio greater than 21 to 1. O&M and spares budgeting assumes that a viable CIP effort is in place. Without the outyear cost avoidance provided by CIP, outyear support costs would have to be increased drastically. CIP funding is driven by field events and types/maturity of engines, not by the total engine quantity.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Continued effort to reduce air aborts, aircraft safety incidents, not-mission-capable rates, scheduled and unscheduled engine removals, maintenance man-hours, and overall costs.
   - (U) Effort included 5,500 ground test hours (4,850 sea level test hours; 650 altitude test hours) and 100 flight test hours to analyze, verify, and approve 218 CIP tasks (146 redesign tasks; 72 repair tasks), generating an estimated $1.6B LCC savings.
   - (U) F100 (F-15/F-16): Redesigned first stage high pressure turbine blade cooling pattern to reduce blade erosion caused by cooling hole blockage, generating a $18.4M LCC savings.

Program Element: #0604268F
PE Title: Aircraft Engine Component Improvement Program (CIP)
Project Number: N/A
Budget Activity: #4 - Tactical Programs

- (U) F110 (F-16): Redesigned/reworked the high pressure turbine forward outer seal to reduce radial stress, thus permitting a low cycle fatigue (LCF) life increase from 3000 to 6000 cycles and generating a $52.4M LCC savings.
- (U) TF30 (F-111): Redesigned retention method for inner transition duct liner to eliminate liner/turbine nozzle distress caused by worn retention feet, resulting in $9.0M LCC savings.
- (U) Initiated F100/F110 Increased Performance Engines (IPEs) effort.

2. (U) FY 1991 Planned Program:
   - (U) Continue effort to reduce air aborts, aircraft safety incidents, not-mission-capable rates, scheduled and unscheduled engine removals, maintenance man-hours, and overall costs.
   - (U) Effort to include 6,876 ground test hours (5,702 sea level test hours; 1,174 altitude test hours) and 195 flight test hours to analyze, verify, and approve 322 CIP tasks (253 redesign tasks; 69 repair tasks), generating an estimated $1.8B LCC savings.
   - (U) F100 (F-15/F-16): Complete design of new nozzle logic control mode change to incorporate Control Mode Optimization (CMO) in digital engine control to increase high/low rotor life by 40%, increase stall margin by 10%, and thrust response by 20%; will dramatically reduce field scheduled engine removals, resulting in $267.5M LCC savings.
   - (U) TF30 (F-111): Redesign combustor with a new material to eliminate early wear out will double the life of the combustor from 750 hours to 1500 hours, reduce unscheduled engine removals by 4%, and reduce maintenance manhours by 6% resulting in a $41.0M LCC savings.
   - (U) F110 (F-16): Redesign exhaust nozzle liner to enhance liner cooling to prevent premature liner failure , which will result in $31.7M LCC savings and a .18/M EFH reduction in the Nonrecoverable Inflight Shutdown (NRIFSD) rate.
   - (U) F101 (B-1): Complete the Engine Structural Integrity Life Improvement effort to improve the residual lives of fracture critical parts, which will result in $46.1M LCC savings.

3. (U) FY 1992 Planned Program:
   - (U) Continue effort to reduce air aborts, aircraft safety incidents, not-mission-capable rates, scheduled and unscheduled engine removals, maintenance man-hours, and overall costs.
   - (U) Effort to include 7,123 ground test hours (6,094 sea level test hours; 1,029 altitude test hours) and 94 flight test hours to analyze, verify, and approve 343 CIP tasks (220 redesign tasks; 123 repair tasks), generating an estimated $1.2B LCC savings.
   - (U) Increased funding addresses backlog of high payoff R&M tasks deferred from FY 1990/91 due to congressional reductions.

4. (U) FY 1993 Planned Program:
   - (U) Continue effort to reduce air aborts, aircraft safety incidents, not-mission-capable rates, scheduled and unscheduled engine removals, maintenance man-hours, and overall costs.
   - (U) Effort to include 6,037 ground test hours (5,264 sea level test hours; 773 altitude test hours) and 109 flight test hours to analyze, verify, and approve 294 CIP tasks (174 redesign tasks; 120 repair tasks), generating an estimated $1.8B LCC savings.

Program Element: #0604268F
PE Title: Aircraft Engine Component Improvement Program (CIP)

Project Number: N/A
Budget Activity: #4 - Tactical Programs

5. (U) Program to Completion:
   - (U) Continuing program conducted for each in-service engine to reduce air aborts, safety incidents, not-mission-capable rates, scheduled and unscheduled engine removals, maintenance man-hours, and overall costs.

D. (U) WORK PERFORMED BY: The Propulsion System Program Office (SPO) at Aeronautical Systems Division (ASD), Wright-Patterson AFB OH manages the overall program. Engine CIPs are managed at ASD, and at San Antonio and Oklahoma City Air Logistics Centers. Arnold Engineering Development Center, Tullahoma TN and the Air Force Flight Test Center, Edwards AFB CA conduct in-house test and evaluation efforts. Contractors (and engines) include Allison Gas Turbine, Indianapolis IN (T56, TF41); General Electric Company, Evendale OH (J79, TF39, F101, F110) and Lynn MA (J85, TF34, T64, T58, T700); Allied Signal (Garrett), Torrance CA and Phoenix AZ (T76, Auxiliary Power Units (APU)); Pratt and Whitney, Canada (T400) and West Palm Beach FL (F100, J57, TF30, TF33); Solar Turbine Inc, CA (gas turbine engines); Teledyne, Toledo OH (J69); and Williams International, Walled Lake MI (F107, F112).

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Funding reductions do not permit restoration of support for engines (J57, TF41, T58, T76, T400) zeroed by FY 90/91 funding constraints. Scope of effort for remaining engines reduced to primarily safety tasks, deferring many high return R&M tasks to outyears.
2. (U) SCHEDULE CHANGES: Funding reductions have delayed tasks on all engines. This creates delays in retrofit and increased outyear support costs.
3. (U) COST CHANGES: FY 1991 funding reductions due to fiscal constraints and Congressional review of FY 1991 request.

F. (U) PROGRAM DOCUMENTATION: Not Applicable.

G. (U) RELATED ACTIVITIES:
   (U) PE #0603202F (Aircraft Propulsion Subsystem Integration) provides fan and low pressure turbine technology.
   (U) PE #0603216F (Advanced Turbine Engine Gas Generator) provides compressor, combustor, and high pressure turbine technology.
   (U) PE #0604218F (Engine Model Derivative Program) provides additional component and engine test data.
   (U) PE #0708011F (Industrial Preparedness Program) provides materials processing and component fabrication demonstration.
   (U) PEs #0604268A/#0604268N (Army/Navy Aircraft Engine CIPs).
   (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604270F Budget Activity: # 4 - Tactical Programs
PE Title: EW Development

A. (U) RDT&E RESOURCES ($ In Thousands)

Project Number & Title		FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Comp	Total Prog
1627	Sim, Analysis and Eval	480	300	300	400	Cont	N/A
2066	EF-111A SIP	5110	14300	72116	72900	Cont	TBD
2272	ALE-47 CMDS *	6033	5800	2500	0	Cont	TBD
2274	Advanced CM (QRC 85-04)	1870	1000	200	0	0	3153
2462	COMPASS CALL **	5000	6950	36300	35300	Cont	TBD
2712	ASPJ Common Development	2230	0	0	0	0	249575
2719	F-16/ASPJ Integration	380	15000	0	0	0	15225
2827	F/FB/EF-111 RWR ***	0	477	0	0	0	N/A
2879	EWIR	5000	2450	0	0	0	7392
3108	Airlift Defense Systems	5561	0	10000	10000	10000	35561
3660	AFECO	980	1300	1500	1700	Cont	N/A
3894	JSTARS/SDS	6942	5557	30700	49500	41000	133600
3895	B-1B ARWR	0	0	9800	31900	183100	224800
3896	Adv Strat/Tac IR Exp	0	4500	10000	15000	Cont	TBD
4076	OBEWS ****	540	0	1900	10400	10100	38100
4077	Adv Missile Warning *****	0	0	13500	23562	Cont	TBD
5618	F-15 Protective Systems	20290	19781	26405	31740	Cont	TBD
	AFOTEC Test Support	621	0	0	0	0	-
	B-52 Support	1334	0	0	0	0	-
	TOTAL	62371	77415	215221	282402	Cont	N/A

* Projects under this project number are now identified separately, ALE-47 and OBEWS.
** FY92 and FY93 funding increase is due to a consolidation of funds and effort from PE 0207253F into this PE/project line.
*** Funded in PE 0207168F in FY 90; FY 92 and out incorporated into project 2066.
**** OBEWS was previously identified in project number 2272.
***** This task was previously identified in PE 0604250F, project number 3858.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element consolidates engineering development efforts related to Air Force Electronic Warfare (EW) requirements. The EW Development Program objective is to transition advanced development technologies to installed operational capabilities via Full Scale Development (FSD) programs. (Technology base/advanced development efforts are funded in PE-0603270F, Electronic Combat Technology.)

Program Element: # 0604270F Budget Activity: # 4 - Tactical Programs
PE Title: EW Development

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0M IN BOTH FY 1992 AND FY 1993:

1. (U) Project: 1627, Simulation, Analysis, and Evaluation: This project funds Detachment-1, Armstrong Laboratory/Human Engineering (DET-1, AL/HED) that provides human engineering support and performs man-machine interface and integration studies and analysis for Air Force agencies in areas related to control/display design, development, evaluation and testing. Strategic bomber aircraft avionics suite mock-ups and simulations are developed and specifically designed for flexibility to accommodate rapid hardware configuration changes, plus a data collection capability necessary for human engineering research. Once built, each simulator is maintained to reflect the current configuration of the airplane that it emulates. These simulators are used for engineering factors for proposed avionics modificaitons. Issues such as the application of color to radar warning displays and rapid and flexible mission development for simulators can be studied and verified easily, quickly and inexpensively under full projected combat mission conditions.

(U) FY 1990 Accomplishments:
- (U) Simulator update with AFSATCOM, 75 percent complete.
- (U) Continue study effort initiated in 1989 to determine best type and number of colors to be displayed to crew member to improve increased amounts of data transfers.
- (U) Continued effort started in 1988 to develop a mission planning capability for use in a simulator environment.
- (U) Continued operation of simulations.

(U) FY 1991 Planned Program:
- (U) Completion of AFSATCOM design and implementation.
- (U) Continue AL/HED facility O&M.

(U) FY 1992 Planned Program:
- (U) Continue O&M and update of the strategic aircraft defensive simulators.
- (U) Initiate human factors analysis of colored displays to enhance accurate mission data transfer to the crewmember.

Program Element: # 0604270F Budget Activity: # 4 - Tactical Programs
PE Title: EW Development

(U) FY 1993 Planned Program:
- (U) O&M and update of strategic aircraft defensive simulators for use in human engineering research.

(U) Work Performed By: This effort is in-house development performed by Armstrong Laboratory which is located at Wright-Patterson AFB, OH.

(U) Related Activities:
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable

(U) International Cooperative Agreements: Not Applicable

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604270F Project Number: 2066
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

A. (U) RESOURCES ($ In Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
EF-111A SIP System Improvement Program	5,110	14,300	72,116	72,900	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The EF-111A System Improvement Program (SIP) project updates the EF-111A Tactical Jamming System (TJS). The update is required to keep the system current against the evolving threat. Most Soviet radars use state-of-the-art Electronic Counter-Countermeasure (ECCM) techniques which limit the present jamming system's capability to counter these radars. The SIP will incorporate a new processor, encoder, a mil-qualified computer, MIL-STD 1553-B data bus, an improved Band 4 transmitter, an upgraded exciter, and software changes. The program will also study the integration of narrow-beam antennas, Band 1/2 improvements and ALR-62I Radar Warning Receiver (RWR) integration. These improvements will allow the system to defeat the threat by placing concentrated jamming, with an improved power management system, on specific radars of interest.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Completed restructure of development program to update the TJS.
   - (U) Completed operational assessments/studies to verify the system's requirements against an updated threat base.

2. (U) FY 1991 Planned Program:
   - (U) Initiate TJS upgrade Full Scale Development (FSD).
   - (U) Complete Band 4 modification kit design specification and begin design.
   - (U) Accomplish Preliminary Design Review for encoder, processor, data bus and Ada operation flight program (Digital subsystem).
   - (U) Begin exciter risk reduction.

Program Element: # 0604270F Project Number: 2066
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

3. (U) FY 1992 Planned Program:
   - (U) Continue Full Scale Development.
   - (U) Accomplish Critical Design Review for digital subsystem.
   - (U) Fabricate System Integration Laboratory (SIL) and begin integration and test of digital subsystem upgrade components.
   - (U) Continue modification kit development to update the Band 4 transmitter.
   - (U) Begin exciter Full Scale Development.
   - (U) Conduct exciter Preliminary Design Review.
   - (U) Begin ALR-62I RWR integration, narrow beam antenna and Band 1/2 improvement studies.

4. (U) FY 1993 Planned Program:
   - (U) Continue digital subsystem SIL Testing.
   - (U) Begin digital subsystem Qualification tests.
   - (U) Begin digital subsystem DT&E.
   - (U) Conduct exciter Critical Design Review.
   - (U) Conduct Band 4 qualification test and trial installation.
   - (U) Begin ALR-62I RWR adaptation/integration.
   - (U) Complete ALR-62I RWR integration study.

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

D. (U) Work Performed By: Air Force Systems Command, Aeronautical Systems Division, Wright-Patterson AFB, OH, will manage the development contract. Class V modification of the EF-111 aircraft will be managed by Sacramento Air Logistics Center, Sacramento, CA. Prime contractor is to be determined. The Band 4 upgrade and the Band 9 integration will be managed by Warner-Robins Air Logistics Center, Robins AFB, GA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: None
3. (U) COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION:
(U) TAC SON 319-88, (S) dated 23 Oct 89
(U) TAC SON 337-88, (S) dated 15 Sep 89

G. (U) RELATED ACTIVITIES:
(U) PE 0207252F, EF-111A Squadrons.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

Program Element: # 0604270F Project Number: 2066
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable

I. (U) International Cooperative Agreements: Not Applicable

J. (U) MILESTONE SCHEDULE:

1.	(U)	Prime Contract Award (Digital Subsys & Advanced Exciter)	Mar 91
2.	(U)	Band 4 transmitter upgrade contract award	Aug 91
3.	(U)	Begin full scale development for Advanced Exciter	Dec 91
4.	(U)	Band 4 transmitter upgrade qual testing	Jan 93
5.	(U)	Start Developmental Flight Test (Digital Subsys Upgrade)	Jul 93
6.	(U)	Production Deliveries	Late 1990s

Program Element: # 0604270F Project Number: 2272
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

2. (U) PROJECT NUMBER 2272, ALE-47 COUNTERMEASURE DISPENSER SYSTEM (CMDS): This project develops the ALE-47 CMDS system for the F-16 Block 50 production installations and Block 40 retrofit installations. The ALE-47 CMDS is a Joint AF (lead), Navy and Army program to develop an interactive/smart expendables dispenser for the F-16 and numerous Navy aircraft. The Army will use components of the ALE-47 system to enhance the expendable dispenser systems of their aircraft.

(U) FY 1990 Accomplishments:
- (U) Completed system design, continued fabrication.
- (U) Started engineering and fabrication tests.
- (U) Started system integration laboratory (SIL) tests.

(U) FY 1991 Planned Program:
- (U) Complete engineering and fabrication testing.
- (U) Receive delivery of 20 FSD test support systems.
- (U) Conduct DT&E/IOT&E (Jul 91 - Dec 91).
- (U) Exercise low-rate Initial Production long lead contract option (4/FY91).

(U) FY 1992 Planned Program:
- (U) Complete DT&E/IOT&E of FSD system, Dec 91.
- (U) Exercise low-rate initial production (LRIP) contract option (Dec 91).
- (U) Complete DT&E/OT&E of production representative system (3/FY92).
- (U) Award Lot I Production (3/FY92).

(U) FY 1993 Planned Program:
- (U) Receive delivery of LRIP systems.
- (U) Award Lot II Production.

(U) Work Performed By: Tracor, Austin TX has a FFP contract to accomplish the ALE-47 CMDS FSD and four production lots. The program is managed by ASD/RW at WPAFB OH.

(U) RELATED ACTIVITIES:
- (U) PE 0207133F, F-16 Squadrons
- (U) PE 0604270N, project number W0638
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

Program Element: # 0604270F Project Number: 2272
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

(U) OTHER APPROPRIATION FUNDS ($ In Thousands):

(U) Procurement (Acft):

PE 0207133F	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost BP1000	6,300	8,000	3,300	8,100	34,200	64,900
BP1100	1,900	7,700	8,000	7,900	26,800	52,300
Quantity	0	152	222	213	417	1,004

(U) International Cooperative Agreements: Not Applicable.

Program Element: # 0604270F Budget Activity: # 4 - Tactical Programs
PE Title: EW Development

3. (U) Project: 2274, Advanced Countermeasures (QRC 85-04):
This project will evaluate a pylon mounted implementation of the Technique 101 on tactical aircraft. was developed to counter the advanced angle tracking threat. The QRC 85-04 program will test the concept on an F-4 and F-111 aircraft and conduct live-fire tests using the QF-100.

(U) FY 1990 Accomplishments:
- (U) Contract Award.
- (U) Modified Unit #1.
- (U) Units #2 and #3 started.
- (U) Adapter Kit Designs underway.
- (U) Simulations/Analyses underway.

(U) FY 1991 Planned Program:
- (U) Complete fabrication units #2 and #3.
- (U) Certify for flight test on F-111 and QF-100.
- (U) Accomplish F-111 Flight testing
- (U) Complete Simulations/Analyses

(U) FY 1992 Planned Program:
- (U) Complete QF-100 Flight Tests.
- (U) Final report submitted.

(U) FY 1993 Planned Program:
- (U) No Activities; Effort Completed.

(U) Work Performed By: Raytheon Corporation, Goleta, CA.

(U) Related Activities:
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ In Thousands): Not Applicable

(U) International Cooperative Agreements: Not Applicable

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604270F Project Number: 2462
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

A. (U) RESOURCES ($ in Thousand)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
COMPASS CALL	5,000	6,950	36,300	35,300	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
This project provides engineering development of jammers to

The EC-130H stand-off jamming platform complements both present and future ground-based and sea-based systems to provide theater commanders with a coordinated jamming capability. This project makes major improvements to the initial EC-130H installed equipment and system architecture to

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Developed low-band transmit antenna upgrade kits.
   - (U) Completed preliminary design of new generation jamming system and RF distribution suite.
   - (U) Initiated a program for software reprogrammable

2. (U) FY 1991 Planned Program:
   - (U) Review results of the jamming system antenna preliminary design effort. Select a FSD source.
   - (U) Continue with hardware/software changes to:
     -- (U) of the Direction Finding (DF) subsystem,
     -- (U) Incorporate jamming waveform algorithms for
     -- (U) Study potential receivers to replace the existing receivers with one "generic" receiver.
   - (U) Engineering Change Proposal to improve low-band antenna operation in hi-temp (+100F) environments.
   - (U) Begin integrating the various stand-alone high-band systems onto the aircraft data buss.

Program Element: # 0604270F Project Number: 2462
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

3. (U) FY 1992 Planned Program:
   - (U) Conclude incorporation of the DF subsystem changes and continue upgrades to jamming waveform algorithms.
   - (U) Begin FSD of mid/high band jamming system program.
   - (U) Continue integration of high-band systems.
   - (U) Continue full scale development of program.
   - (U) Continue full scale development of program.

4. (U) FY 1993 Planned Program:
   - (U) Continue upgrades to jamming waveform algorithms.
   - (U) Continue jamming system upgrade.
   - (U) Complete integration of high-band systems.
   - (U) Conduct integration testing of program.
   - (U) Conduct Flight Testing of Low Band
   - (U) Conduct installation testing of subsystem.

5. (U) Program to Completion:
   - (U) Continue upgrades to jamming waveform algorithms.
   - (U) Continue jamming system upgrades.
   - (U) Incorporate new "generic" receiver for improved logistics and signal detection.
   - (U) This is a continuing program.

D. (U) Work Performed By: Aeronautical Systems Division (ASD), WPAFB, OH, manages the development program for the EC-130H COMPASS CALL. Air Force Logistics Command, WPAFB, OH, manages the EC-130H modification program. The primary COMPASS CALL contractors working this program include: Lockheed Aircraft Services, Ontario, CA; Sanders Associates, Nashua, NH; and Magnavox, Ft Wayne, IN.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: An ECP for the low-band antenna was added to correct poor performance in high-temp environments. Upgrades to the COMPASS CALL Mission Simulator (CCMS) were not required (funding used for the above ECP). Descriptions of some efforts were clarified to be more understandable. Funding and effort from PE 0207253F, for FY92 and FY93, were consolidated into this PE/project.

2. (U) SCHEDULE CHANGES: Jamming system upgrade has slipped approximately three months.

3. (U) COST CHANGES: Funding changes reflect consolidation of effort only. Program costs have not changed.

Program Element: # 0604270F Project Number: 2462
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

F. (U) PROGRAM DOCUMENTATION:

- (U) TAF SORD 318-88 1/11/111-A for Counter C3 in Support of Defense Suppression.

G. (U) RELATED ACTIVITIES:

(U) PE-0603270F, Electronic Combat Technology provides technology development. COMPASS CALL, PE 0207253F, procures the system hardware.

(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ In Thousands):

Cost PE-0207253F	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3010	22,800	19,900	36,600	77,400	Cont	-

Note: Portions of the FY 1993 3010 line supports Special Access Required (SAR) activity. The amount of funding associated with the SAR efforts is unclassified.

I. (U) International Cooperative Agreements: Not Applicable

J. (U) MILESTONE SCHEDULE:

1.	(U)	Incrementally fund contract to develop algorithms addressing new signals	1Q/FY 91
2.	(U)	Incrementally fund contract to improve low-band antenna performance	1Q/FY 91
3.	(U)	Award competitive contract for the low-band portion of the jamming system improvements	2Q/FY 91
4.	(U)	Contract for high-band signal acquisition and integration	3Q/FY 91
5.	(U)	Conduct critical design review of program	3Q/FY 92
6.	(U)	Conduct critical design review of program	4Q/FY 92
7.	(U)	Conduct system support facility integration testing of	4Q/FY 92
8.	(U)	Field "direction finding" changes	1Q/FY 93
9.	(U)	Begin first article installation of	3Q/FY 93
10.	(U)	Begin fielding high-band integration	4Q/FY 93
11.	(U)	Begin fielding low-band jamming system improvements	FY 95
12.	(U)	Begin fielding mid/high-band jamming system improvements	FY 95

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604270F
PE Title: EW Development
Project Number: 3108
Budget Activity: # 4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Airlift Defensive System (ADS)	5,561	0	10,000	10,000	10,000	35,561

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
This project provides for the development and prototype of a common defensive system (AAR-47 Missile Warning Reciever; ALE-40 or 47 Countermeasures Dispenser) on tactical and strategic airlift aircraft, specifically the C-17, C-130, C-141, and C-5. This is a design-to-cost effort, utilizing to the maximum extent possible the engineering efforts of Project Snowstorm.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Program redirection downscoped R&D effort.
   - (U) Eliminated integration of defensive systems suite; Class V Mod program undertaken.
   - (U) Project Snowstorm efforts provided initial installation engineering and subsystem assessment.

2. (U) FY 1991 Planned Program:
   - (U) Congressional direction given to have Snowstorm serve as ADS prototype. Project Snowstorm was an FY 90 funded effort. FY91 ADS funding was deferred.
   - (U) Engineering trial and kit install of Group A for C-130, C-141, and C-5 on Snowstorm aircraft.
   - (U) Initial prototype of C-130, C-141, and C-5 under Snowstorm effort.
   - (U) Complete initial flight test of C-130 and C-5 under Project Snowstorm.

3. (U) FY 1992 Planned Program:
   - (U) Flight test of prototype C-141.
   - (U) Commence C-141 and C-5 kit proof.
   - (U) C-17 Group A initial engineering effort begins.
   - (U) C-130 and C-141 kit installations begin.

4. (U) FY 1993 Planned Program:
   - (U) C-17 aircraft engineering continues. Long lead for trial/kit proof.
   - (U) Prototype ALE-47 on C-141 and C-5 aircraft.
   - (U) C-5 aircraft defensive systems kit installs begin.

Program Element: # 0604270F Project Number: 3108
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

- (U) Flight test of Advanced Strategic/Tactical IR Expendables (Project #3896),if available, on C-130, C-141, and C-5 aircraft.

5. (U) Program to Completion:
   - (U) FY94 FOT&E for C-130, C-141 and C-5.
   - (U) FY 94 aircraft installations continue.
   - (U) C-17 Group A engineering completed.

D. (U) Work Performed By: The Airlift Defensive Systems Program Manager is Air Force Logistics Command, Wright-Patterson Air Force Base, OH. C-130 prime contractor is Lockheed, Greenville, SC. C-141 prime contractor is Rockwell, Shreveport, LA. C-17 prime contractor is Douglas Aircraft Company, Longbeach, CA. C-5 prime contractor is Lockheed, Marrietta, GA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Snowstorm directed to serve as ADS prototype. Program downscoped from an integrated defensive system suite to a Class V hardware installation of a missile warning receiver and flare/chaff dispensers.
2. (U) SCHEDULE CHANGES: Elimination of the radar warning receiver and suite integration had compressed the R&D effort and accelerated kit installations. FY91 funds deferral has rephased schedule.
3. (U) COST CHANGES: Out year R&D funds eliminated with the program downscope of suite integration. FY94 funds to allow C-17 effort to be phased based on C-17 production slip out.

F. (U) PROGRAM DOCUMENTATION:
- (U) MAC SON 07-81, Defensive Systems for Airlift Aircraft, (S), 8 Sep 81.
- (U) MAC SORD 07-81-1 (DRAFT), Defensive Systems for Airlift Aircraft, (S), May 90.
- (U) Program Decision Memorandum (PDM), Aug 86.
- (U) HQ MAC Electronic Warfare Master Plan (DRAFT).
- (U) C-17 Defensive System Study, Jul 87, (S).
- (U) C-17 Airlifter Defensive Systems Trade Study, 31 Oct 89, (S).
- (U) AFECO Missile Warning Systems Analysis, 1 Feb 90, (S).
- (U) Program Management Directive for Class V Modification for Airlift Defensive Systems (ADS), 5 Dec 90.

G. (U) RELATED ACTIVITIES:
- (U) PE-0401330F, C-17 Program
- (U) PE-0401115F, C-130 Airlift Squadrons
- (U) PE-0401118F, C-141 Airlift Squadrons
- (U) PE-0401119F, C-5 Airlift Squadrons

Program Element: # 0604270F Project Number: 3108
PE: EW Development Budget Activity: # 4 - Tactical Programs

(U) PE-0404011F, Special Operations Forces.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

A/C Procurement (BP1100 Aircraft Modification):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3010*	0	0	9,900	6,600	Cont	TBD

* C-17 funding moved from ADS to C-17 BP1000 in PE 0401130F by PBD 162.

I. (U) International Cooperative Agreements: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1.	(U)	Award prototype contract for Snowstorm (C-130,C-141,C-5)	Oct 89
2.	(U)	Initial flight test for Snowstorm (C-130,C-141,C-5)	Oct 90
3.	(U)	C-130 Critical Design Review (CDR)	Nov 90
4.	(U)	C-141 CDR	Jun 91
5.	(U)	C-5 CDR	Aug 91
6.	(U)	C-130 kit installs begin	2QTR FY92
7.	(U)	C-17 CDR	FY94

Program Element: # 0604270F Budget Activity: # 4 - Tactical Programs
PE Title: EW Development

4. (U) Project: 3660, Air Force Electronic Combat Office (AFECO). The purpose of this program is to focus USAF Electronic Combat acquisition and upgrade programs; integrate the planning, development, production, life cycle support and modification of USAF EC systems and ensure the EC programs are technically and fiscally executable to meet the user's needs. This is a joint AFSC/AFLC organization.

(U) FY 1990 Accomplishments:
- (U) Continued support to program offices:
  -- (U) B-1B, SOF/Airlift, Electronic Warfare Office, etc
  -- (U) Completion of ALQ-172 Improvements
- (U) EW Database Development to perform:
  -- (U) Program risk assessment
  -- (U) Requirements review
  -- (U) Program executability assessment
  -- (U) Life cycle planning tasks
- (U) Studies and analysis related to and required for:
  -- (U) Development of strategic EC programs
  -- (U) Engineering change proposals
  -- (U) Tentative Need Statements
  -- (U) Future Requirements
- (U) Development of Program Managers Test Guide.
- (U) Supported users and requirements organizations for SON/SORD development.
- (U) Develop a draft Receiver EC test Handbook
- (U) Complete MWS and LWS studies

(U) FY 1991 Planned Program:
- (U) Continue support to EC program offices.
- (U) Development of EC Test Handbooks.
- (U) EC Test Resources Planning and Development.
- (U) EW Database Testing, Evaluation and Certification.
- (U) Studies and analysis related to and required for:
  -- (U) B-1B ECM Radar Cross Section
  -- (U) SOF/Airlift Defensive Systems
  -- (U) HPCM and Emitter Location Studies
- (U) Manage upgrade and distribute Common EC computer simulation.

(U) FY 1992 Planned Program:
- (U) Continued support to EC program offices.
- (U) EW Database Support, Maintenance and Growth.
- (U) Studies and analysis related to and required for:
  -- (U) SOF/Airlift Defensive Systems
  -- (U) Strategic Systems
  -- (U) Tactical Systems

Program Element: # 0604270F Budget Activity: # 4 - Tactical Programs
PE Title: EW Development

- (U) Continue development of EC Test Handbooks
- (U) Manage, upgrade and distribute common EC computer simulations

(U) FY 1993 Planned Program:
- (U) Continue support to EC program offices.
- (U) Manage, upgrade and distribute common EC computer simulations
- (U) Maintain/upgrade EC test handbooks
- (U) EW Database Implementation, Review and Upgrade.
- (U) Studies and analysis related to and required for:
  - -- (U) SOF/Airlift Defensive Systems
  - -- (U) Strategic Systems
  - -- (U) Tactical Systems

(U) Work Performed By: Project is Jointly managed by Air Force Systems Command and Air Force Logistics Command with offices located at WPAFB, OH.

(U) Related Activities:
- (U) AFECO works closely with the JCG-EW to coordinate the exchange of information among related technologies, development, acquisition and modification offices to ensure minimal duplication of function.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable

(U) International Cooperative Agreements: Not Applicable

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604270F
PE Title: EW Development
Project Number: 3894
Budget Activity: # 4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Joint STARS Self-Defense Suite (SDS)	6,942	5,557	30,700	49,500	41,000	133,600

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
Develop a Self-Defense Suite for Joint Surveillance Target Attack Radar System (JSTARS) as directed by the DAB at Milestone IIB. This effort will integrate a suite of defensive avionics to provide situation awareness, early threat warning, and end-game countermeasures to enhance the survivability and mission effectiveness of the Joint STARS. Joint STARS orbits on the friendly side of the Forward Line of Troops (FLOT) to conduct radar surveillance of hostile ground forces, and will be subject to attack by Surface to Air Missiles and Airborne Interceptors. Emphasis is on the selection of off-the-shelf components supported by the minimum development needed to integrate a suite capable of radar warning; missile warning; operator display; and IR, RF, and ARM countermeasures.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Completed the prime contractor's suite integration /effectiveness study.
   - (U) Completed initial assessment of Advanced Threat Warning (ATW) as a potential SDS component.

2. (U) FY 1991 Planned Program:
   - (U) Perform follow-on ATW system performance assessment for SDS application.
   - (U) Examine/develop draft specifications and interface control definition (ICD) for potential SDS components including ATW.
   - (U) Define baseline SDS configuration for full scale development (FSD).

3. (U) FY 1992 Planned Program:
   - (U) Finalize SDS specifications, ICD and request for proposal (RFP).
   - (U) Release RFP.
   - (U) Award FSD contract.
   - (U) Initiate engineering design and associated analysis required for test aircraft modification.

Program Element: # 0604270F Project Number: 3894
PE: EW Development Budget Activity: # 4 - Tactical Programs

4. (U) FY 1993 Planned Program:
   - (U) Continue aircraft #3 engineering/modification efforts.
   - (U) Conduct Preliminary Design and System Software Reviews.

5. (U) Program to Completion:
   - (U) Complete SDS labortory testing.
   - (U) Install and integrate SDS into 3rd Joint STARS FSD aircraft.
   - (U) Conduct SDS flight test.
   - (U) Produce and install SDS into Joint STARS aircraft.

D. (U) Work Performed By: The suite integration study was performed by the Joint STARS prime contractor, Grumman Melbourne Systems Division, Melbourne, Florida. The suite effectiveness evaluation was conducted by CALSPAN Corporation, Buffalo, New York. Component equipment contractors will be identified when the final SDS configuration is selected.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: The decision on SDS baseline definition was extended from Oct 90 to Mar 91 due to delayed completion of the contractor's SDS study efforts. FSD contract award has slipped to Aug 92 due to FY91 funding restrictions (see below).
3. (U) COST CHANGES: FY91 Congressional language reduced and restricted the FY91 funds to Advanced Threat Warning efforts only. This delays completion of RFP preparation until FY92 funds are available, thereby delaying FSD contract award until Aug 92.

F. (U) PROGRAM DOCUMENTATION:
   - (U) JSOR, Apr 87
   - (U) JSORD, Oct 89
   - (U) STAR, Jan 89
   - (U) Joint STARS Acq Decision Memos, Jun 89
   - (U) Joint STARS PMD, 1 Mar 90

G. (U) RELATED ACTIVITIES:
   (U) PE-0604770F Joint STARS Development
   (U) PE-0207581F Joint STARS Procurement
   (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

Program Element: # 0604270F Project Number: 3894
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands):
(U) Procurement (PE-0207581F)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Programs
Cost	0	0	0	0	363,900	363,900

(U) Military Construction: Not Applicable.

I. (U) International Cooperative Agreements: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1.	(U)	Complete Advanced Threat Warning (ATW) assessment	Aug 90
2.	(U)	Complete prime contractor's initial SDS study	Sep 90
3.	(U)	Define baseline SDS configuration (including ATW application, if appropriate)	Mar 91
4.	(U)	Complete draft specification/ICD	Jun 91
5.	(U)	FSD contract award	Aug 92
6.	(U)	Preliminary Design Review (PDR)	3 QTR FY93
7.	(U)	Critical Design Review (CDR)	3 QTR FY94
8.	(U)	Start flight test	FY97
9.	(U)	Production decision	FY98

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604270F
PE Title: EW Development
Project Number: 3895
Budget Activity: # 4 - Tactical Programs

A. (U) RESOURCES ($ In Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
B-1B ARWR	0	0	9,800	31,900	183,100	224,800

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The B-1B is a strategic, long-range, multi-role weapon system capable of performing the mission of a conventional bomber, cruise missile launch platform, and nuclear weapons delivery system in both the tactical and strategic roles. In order to accomplish all missions, it is essential that the aircrew be provided with situational awareness of the threat environment. This capability is not currently available due to deficiencies of the ALQ-161A "Core" system. The addition of a "stand alone" advanced radar warning receiver (ARWR) is an essential operational requirement. The ARWR will detect, process, identify and display the threat radars operating in the range. Without this system, the B-1B will have

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Congressional language in the Department of Defense FY90 Appropriations Act prohibited the use of any funds for research, development, test, evaluation, installation, integration or procurement of an advanced radar warning receiver for the B-1B.

2. (U) FY 1991 Planned Program:
   - (U) FY91 Congressional language continued the prohibition of the use of any funds for RDT&E, integration, or procurement of an advanced radar warning receiver (ARWR) for the B-1B.
   - (U) FY91 Congressional language directed side-by-side simulator evaluation of the ALR-56M and ALR-62I prior to proceeding with the B-1B ARWR effort. This effort is scheduled and funded in FY 92.
   - (U) Using the results of side-by-side testing, determine the feasibility of installing an ARWR on the B-1B. If the risks appear manageable, prepare for initiation of the full scale development (FSD) in FY92.

3. (U) FY 1992 Planned Program:
   - (U) Award FSD contract to complete the development and the integration of the ARWR onto the B-1B aircraft.

Program Element: # 0604270F Project Number: 3895
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

- (U) Development activities include: Group A (aircraft modification, antennas, cabling, etc.), support requirements (tech orders, support equipment, Test Program Sets {TPS}, etc.) and any required Group B (actual ARWR Line Replaceable Units {LRU}) changes required for integration on the B-1B.

4. (U) FY 1993 Planned Program:
   - (U) Continue FSD effort.
   - (U) Thoroughly test installed performance of the ARWR on the B-1B aircraft

5. (U) Program to Completion:
   - (U) Complete testing program
   - (U) Award contract for procurement of B-1B ARWR
   - (U) Install ARWR into B-1B fleet.
   - (U) This is a continuing program.

D. (U) Work Performed By: The program is managed by the B-1B System Program Office (SPO), Aeronautical Systems Division (ASD), Wright-Patterson AFB, OH, until mid May 1991. At that time the Systems SPO at ASD will assume overall responsibility for the development of the B-1B bomber. Rockwell International, North American Aircraft Operations, Los Angeles, CA, is the airframe manufacturer.

The Systems SPO will manage the B-1B ARWR effort. Although not finalized, it appears that additional contractors include Boeing Aerospace Company, Seattle, WA; Loral, Systems Manufacturing Company, Yonkers, NY; Delmo Victor, Belmont, CA. Government facilities used in this development include: the Air Force Anechoic Facility (AFAF), Edwards AFB; Rome Air Development Center (RADC), Griffis AFB, NY; Air Force Electronic Warfare Evaluation Simulator (AFEWES), Dallas, TX; Dynamic Electromagnetic Environmental Simulator (DEES), WPAFB, OH. For optimization of system controls and displays, the Det 1 AL/HED at Aeronautical System Division will be used. Testing of the integration of the ARWR with B-1B avionics will be accomplished at the Electronic Warfare Avionics Integration Support Facility (EWAISF), Warner Robins Air Logistics Center, Robins AFB, GA or at the Avionics Integration Simulator Facility (AISF), Tinker AFB, OK.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: One year restructure to accomodate side-by-side testing.
3. (U) COST CHANGES: FY 91 reduction from $45.471M to $0.0.

Program Element: # 0604270F Project Number: 3895
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

F. (U) PROGRAM DOCUMENTATION:
- (U) SAC-SON 3-66, 10 Nov 78
- (U) SAC-SORD 003-66-I/II/III/IV-(A), 1 Oct 89
- (U) SAC-MENS, 8 Jun 81
- (U) DEPSECDEF B-1B Program (Baseline Nov 81)
- (U) B-1B TEMP, 7 Nov 88
- (U) B-1B PMD, 4 Jan 88

G. (U) RELATED ACTIVITIES:
- (U) Design and development of the ALQ-161A "Core" system is nearing completion. The system is currently completing flight test.
- (U) ALQ-161A "Core" testing will be complete 28 Feb 91.
- (U) Concurrent "Core"/RWR testing will not be possible in FY 1990/91 since the RWR will not be ready for testing until FY 1996.
- (U) Joint Potential Designator to be determined at Milestone II.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) PE-010126F, B-1 Squadrons

H. (U) OTHER APPROPRIATION FUNDS ($ In Thousands): Not Applicable.

I. (U) International Cooperative Agreements: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1.	(U) ALQ-161A Tests	Jun 1988
2.	(U) ALQ-161A "Core" DT&E	Jul 1990
3.	(U) ALQ-161A "Core" System Qualification Test	Nov 1990
4.	(U) ALQ-161A "Core" Flight Tests	Feb 1991
5.	(U) B-1B ARWR Risk Reduction Flights	TBD
6.	(U) B-1B ARWR Ground Testing	TBD
7.	(U) B-1B ARWR Flight Testing	TBD

Program Element: # 0604270F Project Number: 3896
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Advanced Strategic/Tactical IR Expendables	0	4,500	10,000	15,000	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The project develops advanced infrared (IR) expendables for airlift, strategic and tactical aircraft.
indicate that improvements to the
Flight test and
threat assessment analysis also show that the
has been significantly This
program will develop and demonstrate an advanced IR expendable to defeat these advanced IR missiles. This is a FY 91 new start.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Issued program direction.
   - (U) Developed program options for the advanced expendable.
   - (U) Continued exploitation of
   - (U) Funding for the program was zeroed in FY 90.

2. (U) FY 1991 Planned Program:
   - (U) Convene a threat assessment working group.
   - (U) Initiate threat modeling and analysis.
   - (U) Complete IR signature data collection on selected airlift, strategic and tactical platforms.
   - (U) Survey industry IR&D and DoD advanced development expendable efforts to identify capable articles.
   - (U) Conduct prototype demonstration tests of candidate flare designs identified during survey.

3. (U) FY 1992 Planned Program:
   - (U) Continue evaluation of expendables identified during industry/DoD survey.
   - (U) Continue threat modeling and analysis.
   - (U) Continue prototype demonstration test of candidate flare designs.

4. (U) FY 1993 Planned Program:
   - (U) Complete evaluation of expendables identified during industry/DoD survey.

Program Element: # 0604270F Project Number: 3896
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

- (U) Continue threat modeling and analysis.
- (U) Complete prototype demonstration test of candidate flare designs.
- (U) Initiate full scale development (FSD).

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

D. (U) Work Performed By: The Air Force Electronic Combat Office completed a study that identified the need for an in-depth concept exploration program prior to starting an FSD program. Aeronautical Systems Division will manage this program. Several contractors provided viable alternatives which will be evaluated during this program. USAF Tactical Air Warfare Center will assist in conducting prototype demonstration tests. Wright Research and Development Center Electronic Warfare Division will provide technical expertise and help mature candidate technologies.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: None
3. (U) COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION:
- (U) SAC SON 11-88, Dec 88.
- (U) TAC SON 323-88, 6 Sep 88.

G. (U) RELATED ACTIVITIES:
- (U) PE-0603270F, Electronic Combat Technology.
- (U) PE-0603270N, Electronic Combat Technology.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense

H. (U) OTHER APPROPRIATED FUNDS ($ in Thousands): Not Applicable

I. (U) International Cooperative Agreements: Not Applicable

J. (U) MILESTONE SCHEDULE:

1.	(U) Initiate Concept and Exploration	FY 91
2.	(U) Initiate FSD	FY 93
3.	(U) Initiate Production	FY 95

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604270F Project Number: 4076
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

A. (U) RESOURCES ($ In Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
On Board Electronic Warfare Simulator (OBEWS)	540	0	1,900	10,400	10,100	38,100

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project develops the On Board Electronic Warfare Simulator (OBEWS). OBEWS will provide on-board electronic warfare (EW) continuation training for F-16 and F-15E pilots by supplementing or completely simulating their outside radar signal environment with digital signals. Tactical Air Force pilots receive training on electronic combat (EC) ranges once every 1-2 years. To complement this training, OBEWS will provide needed continuation training at their home bases. An OBEWS proof of concept prototype was developed and flight tested at Eglin AFB in 1989 to evaluate the operational effectiveness and suitability of OBEWS as an EC training device. The prototype consisted of a pod mounted system interfaced through the F-16's ALR-69 radar warning receiver (RWR). The follow-on engineering, manufacturing and development (EMD) system will be internally mounted and work through each platform's radar warning receiver (RWR). For the F-16 both ALR-56M and ALR-69 RWR equipped aircraft will be installed with OBEWS. For the F-15E OBEWS will work through the ALR-56C RWR. Software developed under the OBEWS prototype contract will be supplied as government furnished media to the EMD contractor(s).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Successfully completed IOT&E flight test of OBEWS prototype.

2. (U) FY 1991 Planned Program:
   - (U) Plan for FY 92 request for proposal (RFP) release.

3. (U) FY 1992 Planned Program:
   - (U) RFP for OBEWS engineering, manufacturing and development (EMD).
   - (U) Select source.
   - (U) Award EMD contract with production options.

Program Element: # 0604270F Project Number: 4076
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

4. (U) FY 1993 Planned Program:
   - (U) Continue OBEWS engineering, manufacturing and development (EMD).

5. (U) Program to Completion:
   - (U) Continue EMD.
   - (U) Conduct DT&E and IOT&E.
   - (U) Production decision and award production options.

D. (U) Work Performed By: OBEWS prototype contractor was AAI, Baltimore, MD. However, the EMD contract will be awarded competitively. The program is managed by the Simulator Program Office, Aeronautical Systems Division (ASD/YIJ) at Eglin AFB, FL.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: The F-15E was added as a production platform in addition to the F-16. OBEWS EMD system will be internally mounted in the aircraft versus an external pod.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:
   (U) TAF SON 317-88, OBEWS, 26 May 89
   (U) TAF SORD 317-88-I-A, 18 Sep 90
   (U) SAC SON 010-87, On Board Training System (Draft)

G. (U) RELATED ACTIVITIES:
   (U) PE 0207133F, F-16 Squadrons
   (U) PE 0207134F, F-15E Squadrons
   (U) PE 208006F, Mission Planning Systems
   (U) PE 0207597F, Training - Tactical Air Force
   (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ In Thousands):

(U) Procurement (Acft):

PE 0207597	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost ($ in Millions)	0	0	0	57,600	57,600
Quantity					
OBEWS (on board systems)				146	146

Program Element: # 0604270F Project Number: 4076
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

I. (U) International Cooperative Agreements: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1.	(U)	OBEWS Prototype DT&E Test Report - Complete	Sep 1989
2.	(U)	OBEWS Prototype IOT&E Test Report - Complete	Dec 1989
3.	(U)	EMD RFP Release	Mar 1992
4.	(U)	EMD Contract Award	Aug 1992
5.	(U)	CDR	Aug 1993
6.	(U)	DT&E Complete	Dec 1994
7.	(U)	IOT&E Complete (including test report)	Jun 1995
8.	(U)	Production Decision	Jun 1995
9.	(U)	IOC	Mar 1996

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270F
PE Title: EW Development
Project Number: 4077
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Advanced Missile Warning	0	0	13,500	23,562	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
Missile warning systems are required to effectively reduce aircraft combat attritions within mission areas that contain threats of increasing complexity and numbers. Current missile warning systems are inadequate and rely on visual acquisition of the missile. This project develops and integrates missile warning system technologies for current generation/operational tactical aircraft. Pre-Full Scale Development examined potential of transitioning technologies from the Integrated Electronic Warfare System (INEWS) program. However, this program will incorporate demonstrated technologies to meet operational requirements for missile warning to counter the post-2000 year missile threat. Without this system, survivability of current generation tactical fighter aircraft will decrease due to improvements in threat missile systems, i.e., advanced electro-optics, infrared and radio frequency missile seekers.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Refined system requirements through analysis of threat and aircraft mission.
   - (U) Completed integration feasibility studies, including installation concept and risk assessment, installed performance and associated life cycle cost estimates.
   - (U) Began thermal risk reduction task for two candidate platforms to establish risk associated with using liquid cooled modules in an air-cooled environment.

2. (U) FY 1991 Planned Program:
   - (U) Prepare for FY92 Full Scale Development start.

3. (U) FY 1992 Planned Program:
   - (U) Award Full Scale Development contract.
   - (U) Prepare for Preliminary Design Review of system hardware components.

4. (U) FY 1993 Planned Program:
   - (U) Conduct Preliminary Design Review for system hardware components.

Program Element: #0604270F
PE Title: EW Development
Project Number: 4077
Budget Activity: #4 - Tactical Programs

- (U) Conduct Software Specification Review.
- (U) Conduct Critical Design Review for system software and hardware.
- (U) Fabricate prototype hardware components.

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

D. (U) Work Performed By: In-house work conducted by Electronic Warfare and Reconnaissance Program Office, Aeronautical Systems Division, Wright-Patterson AFB, OH. Major contractors in pre-FSD efforts are Sanders/General Electric INEWS Joint Venture Team, Nashua NH. and TRW/Westinghouse INEWS Joint Venture Team, San Diego CA and Baltimore MD. Full scale development contractor is still to be determined.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTIVE OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:
(U) TAF SON 304-80, Tactical Self-Protection Electronic Warfare Systems, 15 Jan 81 (S).
(U) TAF SON 316-88, Missile Warning System, 6 Sep 89 (S).

G. (U) RELATED ACTIVITIES:
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands): Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1. (U)	Complete Pre-FSD Phase	Sep 1991
2. (U)	Begin FSD Phase	Apr 1992
3. (U)	Production Deliveries	Late 1990s

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604270F Project Number: 5618
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

A. (U) RESOURCES ($ In Thousands)
Project Title: F-15 Protective Systems

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
TEWS	20,290	19,781	26,405	31,740	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
This project develops the Tactical Electronic Warfare System (TEWS) improvements and upgrades to the F-15 self-protection suite. The F-15 TEWS consists of the ALR-56 Radar Warning Receiver (RWR), the ALQ-135 Internal Countermeasures System (ICS), the ALQ-128 Electronic Warfare Warning System and the ALE-45 Countermeasures Dispenser (CMD). Hardware development of the ALR-56C, ALQ-135 Band 3, ALE-45, and ALQ-128 are complete with initial software loads tested and fielded.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) ALQ-135 Band 3 Phase 1 software development completed.
   - (U) ALQ-135 Band 3, Phase 1 DT&E complete Jul 90. OT&E flight test complete - Oct 90.
   - (U) F-15E ALQ-135 Band 3 installs started May 90.
   - (U) TEWS integration testing continues.
   - (U) Fielded software changes required in ICS, RWR, and CMD to support Desert Shield.

2. (U) FY 1991 Planned Program:
   - (U) Integration testing continues, PRIMES, CT&E, DT&E.
   - (U) ALQ-135 Lot IV system deliveries begin.
   - (U) Demonstrate ALQ-135 Phase II capability against Compass Glory threats.
   - (U) ALR-56C complete development of Preflight Message Generator.
   - (U) ALQ-135 develop rapid reprogramming capability.
   - (U) Continue to support Desert Shield.

3. (U) FY 1992 Planned Program:
   - (U) Continue development testing to support TEWS Integration and Radio Frequency Compatibility Programs.
   - (U) Conduct TEWS Threat Studies.
   - (U) ALQ-135 development of improved antennas.

Program Element: # 0604270F Project Number: 5618
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

- (U) Begin refurbishment of ALR-56C and ALQ-135 test assets for return to operational inventory.
- (U) Complete OT&E of ALQ-135 phase II full specification system and install.
- (U) Complete ALE-45 program management responsibility transfer (PMRT) to Logistics Command.

4. (U) FY 1993 Planned Program:
   - (U) Continue threat studies to include combined countermeasures.
   - (U) Complete refurbishment of test assets.
   - (U) Delivery of TEWS integrated base line software to F-15Cs.
   - (U) Accomplish annual software update and testing.
   - (U) Complete ALR-56C PMRT.

5. (U) Program to Completion:
   - (U) Improve integration of TEWS with aircraft avionics and fire control radar.
   - (U) Annual upgrades to defeat the evolving threat.
   - (U) Complete ALQ-135 PMRT.
   - (U) This is a continuing program.

D. (U) Work Performed By: F-15 Program Office, Wright-Patterson, AFB, OH, is the system integrator. Loral, Yonkers, NY is the prime for the ALR-56C. Northrop, Rolling Meadows, IL is the prime for the ALQ-135. TRACOR, Austin, TX is the prime for the ALE-45.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: $3.5M (increase) in FY 91 for ALQ-135 test support. $2.5M (increase) in FY 91 for connecting the ALQ-135 to the wheel-well software reprogramming port.

F. (U) PROGRAM DOCUMENTATION:
   (U) TAC ROC 9-68, Feb 1968.
   (U) DCP #19, Rev C, May 77, amended Feb 80.
   (U) TAF SON 321-82, Nov 84.
   (U) F-15E TEMP, Nov 87 (TEWS Annex complete).
   (U) TAF SON 304-80
   (U) ALQ-135 SORD, Jul 90

Program Element: # 0604270F Project Number: 5618
PE Title: EW Development Budget Activity: # 4 - Tactical Programs

G. (U) RELATED ACTIVITIES:

(U) F-15E aircraft is developed and produced in PE 0207134F.
(U) F-15C multi stage improvement kits are provided in PE 0207130F.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ In Thousands):

(U) Procurement (BA 01)

ACFT Procurement PE 0207130F, 0207134F	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
ALR-56C Funds	55,900	29,300	29,900	20,700	0	TBD
ALR-56C Qnty	69	47	42	27	0	
ALQ-135 Funds	57,000	0	138,700	230,300	407,600	TBD
ALQ-135 Qnty Band 3	28	0	54	110	184	

I. (U) International Cooperative Agreements: Not Applicable

J. (U) MILESTONE SCHEDULE:

1.	(U)	ALQ-135 ICS P3I Development Contract Award	Mar 1985
2.	(U)	ALR-56C DT&E/IOT&E Flight Test (concurrent)	Oct 1985
3.	(U)	ALQ-135 ICS QRC Band 3 Deliveries	Feb 1986
4.	(U)	ALR-56C Deliveries	May 1986
5.	(U)	ALQ-135 ICS QRC Band 3 DT&E/IOT&E Flight Test	May 1986
6.	(U)	ALE-45 CMD Production Deliveries	Jul 1986
7.	(U)	ALQ-135 ICS P3I Critical Design Review	Nov 1986
8.	(U)	ALQ-135 P3I Production Contract Award	Dec 1986
9.	(U)	Integrated F-15 TEWS Flight Test	Jul 1987
10.	(U)	ALQ-135 P3I Band 3 Production Deliveries start	Feb 1989
11.	(U)	ALQ-135 Lot IV & V J&A with FAAA	Feb 1989
12.	(U)	ALQ-135 Phase I Developmental Testing complete	May 1990
13.	(U)	F-15E Early Operational Assessment complete	Nov 1990
14.	(U)	ALQ-135 Phase II Integration Testing	Feb 1991
15.	(U)	ALQ-135 Phase II Developmental Testing starts	Jul 1991
16.	(U)	ALQ-135 Phase II Operational Testing starts	Dec 1991

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604312F Budget Activity: #3 - Strategic Programs
PE Title: ICBM Modernization

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Start Compliance	0	3,107	4,083	3,900	TBD	TBD
Peacekeeper in Minuteman Silo	10,362	7,463	2,906	5,532	5,247	6,427,308
Peacekeeper Rail Garrison	739,074	352,048	260,082	100,054	102,731	TBD
Small ICBM	87,500	202,152	548,838	714,670*	2,723,400	7,467,800
Total	836,936	564,770	815,909	824,156	TBD	TBD

*Contains initial funding for Drell Panel recommendations.

B. (U) BRIEF DESCRIPTION OF ELEMENT: ICBM modernization is demanded by the need to respond to a major imbalance between the United States and Soviet strategic capabilities caused by Soviet ICBM developments. The mission of this program is to support the U.S. strategic deterrent policy while responding to changes in the projected Soviet threat and target base. The modernization program recognizes that all ICBM tasks cannot be served by a single missile or a single basing mode. The near-term response -- fifty Peacekeepers in Minuteman silos -- reduces the Soviet advantage in ICBM capability and helps deter a broad spectrum of potential threats, including massive conventional or limited nuclear attack on the United States or our allies. The long-term response protects the option to deploy Peacekeeper missiles on Rail Garrison and Small ICBM in Hard Mobile Launchers (HMLs). The two missiles possess complimentary capabilities, which will greatly reduce the likelihood of a successful Soviet attack. Further, the program is affordable, and will greatly strengthen our START negotiating position and the quality of post-START forces.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Peacekeeper in Minuteman Silo:
Continues the Simulated Electronic Launch - Peacekeeper (SELP) and Operational Testing (OT) programs and the effort to improve Specific Force Integrating Receiver (SFIR) reliability.

(U) FY 1990 Accomplishments:
- (U) Continued SELP and OT programs.
- (U) Continued SFIR improvement effort.

(U) FY 1991 Planned Program:
- (U) Continue SELP and OT programs.
- (U) Continue SFIR improvement effort.
- (U) Complete missile production (114 missiles).

(U) FY 1992 Planned Program:
- (U) Continue SELP and OT programs.
- (U) Continue SFIR improvement effort.

Program Element: # 0604312F Budget Activity: #3 - Strategic Programs
PE Title: ICBM Modernization

(U) FY 1993 Planned Program:
- (U) Continue Simulated Electronic Launch - Peacekeeper (SELP) and Operational Testing (OT) programs.
- (U) Continue Specific Force Integrating Receiver (SFIR) improvement effort (Alternate SFIR wheel).

(U) Program to Completion:
- (U) Complete Program Management Responsibility Transfer (PMRT) for Aeronautical Vehicle Equipment (AVE).
- (U) Continue SFIR improvement effort.

(U) Work Performed By: The program is managed by Ballistic Missile Organization (BMO), Norton Air Force Base, CA. Facilities at Arnold Engineering Development Center, Tullahoma, TN, are used for motor testing and facilities at the Central Inertial Guidance Test Facility at Holloman AFB, NM, are used for guidance testing. Flight testing is conducted at Vandenberg AFB, CA. The top five ICBM Modernization Program contractors are Martin Marietta Aerospace, Denver, CO (Assembly, Test and Systems Support; Peacekeeper Support Equipment); Boeing Aerospace, Seattle, WA (Basing Operational Support); Rockwell Autonetics, Anaheim, CA (Guidance and Control); Northrop Electronics Division, Hawthorne, CA (Inertial Measurement Unit); and Textron, Wilmington, MA (Re-entry Vehicle/Reentry System).

(U) Related Activities:
- (U) Program Element # 0101215F, Peacekeeper Squadrons, for Airborne Launch Control Center Modifications.
- (U) Program Element # 0101215F, Peacekeeper Squadrons, for Flight/Ground Test Support.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):

(U) Missile Procurement (BA 4; P-1 Line 001):
(Weapon System only)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	731,203	534,500	195,200	0	0	9,745,300
Quantity	12	12	0	0	0	114

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604312F
PE Title: ICBM Modernization

Project Number: N/A
Budget Activity: #3 - Strategic Programs

Project Title: Peacekeeper Rail Garrison



POPULAR NAME: Rail Garrison

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Major Contract	596,264	227,182	179,947	59,787	TBD
Support Contract	79,867	73,699	47,007	21,833	TBD
In-House Support	8,710	8,900	4,950	2,780	TBD
GFE/ Other	54,233	42,267	28,178	15,654	TBD
Total	739,074	352,048	260,082	100,054	102,731
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	ROD - 11/89	PMD - 3/91			TBD
Engineering Milestones	PDR - 5/90	CDR - 8/91			TBD
T&E Milestones		CALTP II - 10/90 CALTP III - 5/91	Mobility Demo 7/92 MLC/LCC INT 11/91	Launch BVM 12/92	TBD
Contract Milestones					

Program Element: # 0604312F
PE Title: ICBM Modernization
Project Number: N/A
Budget Activity: #3 - Strategic Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The military need for ICBM modernization stems from the requirement to respond to Soviet ICBM developments, which are causing a major imbalance between the United States and Soviet strategic capabilities. The overall mission of the ICBM modernization program is to support the U.S. strategic deterrent policy while responding to changes in the projected Soviet threat and target base. The modernization program is built on the recognition that all ICBM tasks cannot be served by a single missile or a single basing mode. The response includes continuing the development of Rail arrison, should the future threat necessitate its deployment.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Completed Chapter 11 rail car tests.
   - (U) Completed Mechanical Development Test (MDT) at Vandenberg AFB (VAFB).
   - (U) Record of Decision (ROD) was announced for remaining six bases.
   - (U) Completed Phase III of the Habitability Test Program.
   - (U) Critical Design Reviews (CDRs) 64% completed.
   - (U) Completed system integration at VAFB.
   - (U) Completed Phase II Canister Assembly Launch Test Program (CALTP).
   - (U) Completed Phase IIA land navigation testing.
   - (U) Received delivery of all engineering models (EM), including one fuel car, one maintenance car, two security cars, four missile launch cars (MLC), and three launch control cars (LCC).
   - (U) Obtained design authorization for garrisons at bases 2-4.
   - (U) Source of Repair Decision was made.
   - (U) Completed Canister/Missile/MLC integration tests.
   - (U) Conducted command/status demoat the Development Integration Lab (DIL).
   - (U) Received delivery of locomotive operational models (OM).
   - (U) Completed Transportation Test Center (TTC) Rail Garrison Car Roadworthiness.
   - (U) Completed Initial Confidence testing.
   - (U) Completed construction of VAFB test facilities.
   - (U) Funded development of Dual Frequency MEECN Receiver (DFMR).

2. (U) FY 1991 Planned Program:
   - (U) Complete prime item development specification.
   - (U) Conduct EM demonstrations at the DIL.
   - (U) Complete Rail Car/Train dynamics testing.
   - (U) Complete CALTP III.
   - (U) Complete Guidance & Control (G&C) Software Test Readiness Review.
   - (U) Complete MLC/LCC integration.
   - (U) Complete CDRs.
   - (U) Complete Interface Control Drawings.
   - (U) Receive first MLC OM (Pathfinder OM-4).
   - (U) Begin functional configuration audits (FCAs).
   - (U) Conduct mobility testing.
   - (U) Conduct OM demonstration at the DIL.
   - (U) Receive first Basing Verification Missile (BVM) and Aerospace Vehicle Equipment (AVE) hardware.
   - (U) Baseline the logistics support analysis (LSA)/LSA Review.

3. (U) FY 1992 Planned Program:
   - (U) Complete Mobility Mode Testing.
   - (U) Complete Pathfinder Testing.
   - (U) Complete Guidance and Control FCA.
   - (U) Complete delivery of OMs to VAFB.

Program Element: # 0604312F
PE Title: ICBM Modernization
Project Number: N/A
Budget Activity: #3 - Strategic Programs

- (U) Complete Train Mobility Exercise.
- (U) Start BVM test and assembly.

4. (U) FY 1993 Planned Program:
   - (U) Launch BVM-1.

5. (U) Program to Completion:
   - (U) Evaluate operational and physical security system concepts.
   - (U) Document sufficient design detail to allow resumption of FSD if directed.
   - (U) This is a continuing RDT&E program.

D. (U) WORK PERFORMED BY: The program is managed by the Ballistic Missile Organization, Norton Air Force Base, CA. Facilities at the Rail Transportation Test Center and Vandenberg AFB are used for development, integration, and system level tests. The major contractors are: Boeing Aerospace, Seattle, WA (Basing, Test, and System Support (BT&SS)); Westinghouse Electric, Sunnyvale, CA (Missile Launch Car); Rockwell Autonetics, San Bernadino, CA (Launch Control System); Rockwell Autonetics, Anaheim, CA (Guidance and Control); and the Peacekeeper aeronautical vehicle equipment contractors will provide missile components.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:
1. (U) TECHNICAL CHANGES: The FY 92/93 President's Budget coupled with the deletion of the MILCON and procurement funds in the FY 91 request cancels deployment and removes the program from Full Scale Development (FSD). Current funding supports completing the design, fabricating one set of test assets, conducting one flight test, and performing limited mobility testing. The objective is to demonstrate missile launch capibility from a train and conduct mobility exercises to evaluate train operational and physical security concepts. The existing program deletes: (1) all production, deployment, and garrison related activities, (2) dedicated IOT&E testing, (3) four flight tests, (4) train support equipment, and (5) some operational model hardware.
2. (U) SCHEDULE CHANGES: The program office has developed a FSD program with a restructured schedule leading to a single flight test from a train (BVM-1) in Dec 1992. All milestones beyond that are currently "To Be Determined."
3. (U) COST CHANGES: All Procurement and Military Construction funds have been deleted. The RDT&E funding levels in the Six Year Defense Plan necessitated a complete restructure and significant reduction of the planned program to one whose primary objective is to demonstrate the missile launch capability from a train and to evaluate operational and physical security concepts. Eliminated four BVMs and diluted DT&E/IOT&E testing to an operationally demonstrated assessment.

F. (U) PROGRAM DOCUMENTATION:
- (U) SAC ROC 16-71 (Revised), 1 Feb 79 (S)
- (U) SAC SORD 018-87-II, Aug 88 (S)
- (U) BCD, Jul 90 (U)
- (U) WSS, Apr 90 (U)
- (U) DCP, Mar 88 (S)
- (U) STAR, Mar 88 (S)
- (U) ILSP, Mar 89 (U)
- (U) TEMP, Jun 89 (S)

G. (U) RELATED ACTIVITIES:
- (U) Program Element # 0101215F, Peacekeeper Squadrons, for Airborne Launch Control Center Modifications.

Program Element: # 0604312F
PE Title: ICBM Modernization
Project Number: N/A
Budget Activity: #3 - Strategic Programs

- (U) Program Element # 0101215F, Peacekeeper Squadrons, for Flight/Ground Test Support.
- (U) Program Element # 0101215F, Peacekeeper Squadrons, for Peacekeeper missile production (shared).
- (U) Program Element # 0604312F, ICBM Modernization, for Peacekeeper in Minuteman Silo missile development (shared).
- (U) Program Element # 0303131F, Minimum Essential Emergency Communications Network (MEECN) contains FY 90 development funding for dual frequency MEECN receiver.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
Static Load	06/88 - 09/88	Launch load reaction is well within program requirements
Stationary Vibration	10/88 - 11/88	Results within program requirements
CALTP Phase I	7/89	First launch indicated MLC and track launch reaction loads are within requirements
Land Navigation Phase I	08/87	Inertial instruments stable
Land Navigation Phase II	12/88 - 03/89	Initial conditions for Phase IIA sled tests generated; demonstrated/evaluated a number of land navigation techniques
Land Navigation Phase IIA	06/89 - 10/89	G&C performance during sled tests consistently within accuracy requirements and associated timelines
CALTP Phase II	07/90, 10/90	Results within program requirements
SYSTEM INTEGRATION		
Canister/Missile/MLC Integration	07/90	Results within program requirements
Train Integration	12/90	Results within program requirements

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
SYSTEM INTEGRATION		
Rail Car/Train Dynamics	02/91	TBD
CALTP Phase III	05/91	TBD
MLC/LCC Integration	06/91 - 11/91	TBD
Mobility Mode Testing	09/91 - 10/91	TBD
WEAPON SYSTEM		
Ground Tests	03/93 - 03/93	TBD
Pathfinder	02/92 - 04/92	TBD
Mobility Launches	02/92 - 09/92	TBD
BVM Launches	12/92 - 03/93	TBD

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604312F
PE Title: ICBM Modernization
Project Number: N/A
Budget Activity: #3 - Strategic Programs

Project Title: Small ICBM



POPULAR NAME: Small ICBM

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Major Contract	62,000	124,100	427,000	579,500	1,977,918
Support Contract	14,975	34,800	41,500	32,800	243,800
In-House Support	5,500	35,800	51,300	74,900	359,800
GFE/ Other	5,025	7,452	29,038	27,470	141,882
Total	87,500	202,152	548,838	714,670	2,723,400
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones			Basing FSD Restart		DAB III 1998 FAD/IOC
Engineering Milestones				HML/WCS PDR 2Q/FY 93 MSL CDR 4Q FY 93	HML Tractor CDR 3Q 94 HML Launcher CDR 3Q 94 WSC CDR 4Q FY 94
T&E Milestones		FTM-2 07/91		FTM-3 3Q/FY 93	FTM 4 - 16 1Q FY 94 - 1Q FY98 HML Cold Launches 2Q FY 96 - 1Q FY 98
Contract Milestones	Missile Restart Supplemental Agreements	Basing Restart Supplemental Agreements			

Program Element: # 0604312F
PE Title: ICBM Modernization
Project Number: N/A
Budget Activity: #3 - Strategic Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
ICBM modernization is required to respond to a major imbalance between the United States and Soviet strategic capabilities caused by Soviet ICBM developments. The mission of this program is to support the U.S. strategic deterrent policy while responding to changes in the projected Soviet threat and target base. The modernization program recognizes that all ICBM tasks cannot be served by a single missile or a single basing mode. ICBM modernization is intended to provide mobile, flexible, highly survivable ICBMs, which enhance strategic stability, deterrence, and arms control. In June 1989, the President decided to continue development of both the Peacekeeper Rail Garrison and the mobile-based Small ICBM programs. Small ICBM is a single RV missile (although the option of 2 RVs is being maintained pending a Presidential decision) capable of basing on a hard mobile launcher (HML) or in modified Minuteman silos. The HMLs can be operated from fixed sites at Minuteman silos or in a random movement mode on bases in the SW. Reliable, secure command and control is being developed to support any operational mode. The FY 90/91 Amended President's Budget contained funds to continue Small ICBM missile development and basing risk mitigation tasks, with restart of full-scale development (FSD) of the entire system in FY 1992, leading to a FAD in Dec 1997.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Completed FTM-1 anomaly investigation and identified and initiated corrective actions.
   - (U) Continued missile development and began fabrication of flight test hardware and spares to continue flight test program.
   - (U) Issued missile supplemental agreements for remainder of FSD program.
   - (U) Continued hard mobile basing risk mitigation development efforts.

2. (U) FY 1991 Planned Program:
   - (U) Continue missile development. Fabricate flight test hardware/spares.
   - (U) Conduct FTM-2 flight test.
   - (U) Develop basing-missile interfaces common to mobile and silo basing.
   - (U) Issue basing restart supplemental agreements for FSD program.

3. (U) FY 1992 Planned Program:
   - (U) Continue missile development. Fabricate flight test hardware/spares.
   - (U) Continue to develop basing-missile interfaces.
   - (U) Restart HML basing FSD.
   - (U) Determine the degree to which the safety concerns of the Drell Panel apply to the design of Small ICBM.

4. (U) FY 1993 Planned Program:
   - (U) Continue missile development. Fabricate flight test hardware/spares.
   - (U) Conduct FTM-3.
   - (U) Continue HML basing FSD; close out HML and WCS PDRs.
   - (U) Begin incorporating Drell-initiated changes, as directed.

5. (U) Program to Completion:
   - (U) Complete the DT&E/IOT&E program (FTMs 4-16).
   - (U) Complete missile and HML development in 1997-98.
   - (U) Fully integrate approved Drell-initiated changes.

Program Element: # 0604312F
PE Title: ICBM Modernization
Project Number: N/A
Budget Activity: #3 - Strategic Programs

D. (U) WORK PERFORMED BY: The program is managed by the Ballistic Missile Organization, Norton Air Force Base, CA. Facilities at Arnold Engineering Development Center, Tullahoma, TN, are used for motor testing and facilities at the Central Inertial Guidance Test Facility at Holloman AFB, NM, are used for guidance testing. The Small ICBM program also utilizes 22 labs and agencies throughout the U.S. to conduct testing and analyses. Flight testing is conducted at Vandenberg AFB, CA. The associate contractors (ASCONs) are Martin Marietta Aerospace, Denver, CO (Assembly, Test and System Support, Post Boost Vehicle); Boeing Aerospace and Electronics, Seattle, WA (Hard Mobile Launcher and Weapon Control System); Rockwell International Rocketdyne Division, Canoga Park, CA (Guidance and Control and Inertial Measurement Unit); General Electric, Philadelphia, PA (Reentry Vehicle/Reentry System); Thiokol, Brigham City, UT (Stage I and Flight Termination Ordnance System (FTOS)); Aerojet, Sacramento, CA (Stage II); Hercules, Magna, UT (Stage III and OFS).

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:
1. (U) TECHNICAL CHANGES: Design changes due to safety concerns of Drell Panel are in budget for beginning of FY 93.
2. (U) SCHEDULE CHANGES: Delays production decision (TBD) and subsequent FAD/IOC.
3. (U) COST CHANGES: Funding for Small ICBM was reduced slightly in the FY 92/93 budget; FY 92 was decreased by $4M and FY 93 was decreased by $11M. The budget does not allocate procurement or MILCON funds during the FY 92-97 period. The FY 94 RDT&E funding was reduced by $6M and advanced procurement funding was zeroed. Funding added to FY 93 and FY 94 for implementation of Drell Panel recommended changes.

F. (U) PROGRAM DOCUMENTATION:
- (U) BCD, 14 Feb 86 (S)
- (U) SAC SON 01-83 (Change 1), 5 May 86 (S)
- (U) SAC SOC, 15 Sep 86 (Updated Apr 88) (S)
- (U) DCP, 1 Nov 86 (S)
- (U) STAR, Jan 87 (S)
- (U) NSD 14, ICBM Modernization and Strategic Defense Initiative (SDI), 14 Jun 89 (S)

G. (U) RELATED ACTIVITIES:
- (U) Program Element # 0604312F, ICBM Modernization, for Peacekeeper Rail Garrison.
- (U) Program Element # 0101215F, Peacekeeper Squadrons, for Airborne Launch Control Center Modifications.
- (U) Program Element # 0101213F, Minuteman Squadrons, for Rapid Execution and Combat Targeting (REACT).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands): None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
Minuteman III Guidance Flight Test #2	Sep 87	Flight tests of AINS guidance systems to evaluate relative performance in a flight environment

Program Element: # 0604312F
PE Title: ICBM Modernization
Project Number: N/A
Budget Activity: #3 - Strategic Programs

T&E ACTIVITY (PAST 36 MONTHS)(Continued)

Event	Date	Results
Canister Assembly and Launcher Test Program (CALTP)	Oct 87, Dec 87, Apr 88	Tests to confirm the test launcher-to-missile interfacing subsystems and launch eject performance
Meteor Burst Field Tests Phases I, II, & III	Oct-Dec 87 Jul-Sep 88 Nov88-Apr 89	Collect data, determine parameters and confirm performance of Meteor Burst Communications
Northern Tier Mobility Test	Dec 87-Mar 88	HML MTB mobility evaluation at Malmstrom AFB (MAFB) under conditions representative of Minuteman (MM) base siting
Land Navigation Tests	Jun-Aug 88	Demonstrate the ability of the IMU to maintain accurate alignment and calibration and perform its land navigation function
Ordnance Firing System (OFS) Flight Proof Test	Feb-Apr 88	Evaluate OFS performance under flight conditions
Stage Firings-All Stages	Feb-Nov 88	Evaluate stage performance at contractor facility, AEDC and NWC
Post-Boost Vehicle (PBV) Firing	Jul-Oct 88	Evaluate PBV performance at AEDC
Command Destruct Test at Naval Weapons Center	Nov 87	Demonstrate capability of the flight termination system to safely destroy the missile if required
Above Ground Nuclear Hardened Parts Testing	Continuous	Characterization of nuclear hardened parts. Data used to support system design
PBV/Shroud/RV Assembly (PSRA)/Stage III Model Survey Test	May 88	Characterize undamped natural test frequencies, and damping of the Small ICBM PSRA/Stage III
Instrumentation and Range Safety System (IRSS) Qualification Testing	Feb 88-Feb 89 Jan 90-May 90	Evaluate performance adequacy of the IRSS for flight test program
Shroud Separation Test	Jun-Jul 88	Evaluate shock induced by shroud separation and verify shroud separation clearances from the PBV, Shroud, Reentry Vehicle (PSRA)
HML Engineering Test Unit (ETU) Mobility and Hardness Transition Tests	Dec 88-Mar 89	HML ETU performance evaluation at MAFB under conditions representative of MM siting
Flight Test Missile (FTM-1)	May 89	First flight test from a test launcher from the pad at VAFB, CA
Post-Boost Vehicle Test	Jan-Sep 90	Evaluate PBV performance
UHF Antenna Test	Sep-Oct 90	HML antenna pattern determination

T&E ACTIVITY (TO COMPLETION)

Event	Planned Date	Remarks
FTM-2	April 91	TBD
FTM-3	3rd Qtr FY 93	TBD
FTM-4 thru FTM-12	1QFY94-1QFY98	TBD
HML Cold Launches	2QFY96-1QFY98	TBD

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604321F Budget Activity: 4 - Tactical Programs
PE Title: Joint Tactical Fusion Program (JTFP)

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
XXX1 Joint Tactical Fusion Program (JTFP)	10,189	4,889				

B. (U) BRIEF DESCRIPTION OF ELEMENT: The JTFP was a joint Army/Air Force effort to develop a near-real-time (NRT), all-source, tactical intelligence fusion and processing/dissemination system. The joint program office was disestablished in Dec 90 and the Air Force is proceeding with the development of a Tactical Air Force (TAF) Linked Operations/Intelligence Centers - Europe (LOCE) Capability (TAFLC). The tactical forces have a need to rapidly (on a NRT basis) exploit time-sensitive and high volume multi-sensor information. The TAFLC will be fielded at the TAF locations requiring automated intelligence processing. This program element funds the development of the LOCE software into an open system standard architecture, hosting the software in the TAC Contingency TACS Automated Planning System (CTAPS), and development of an SCI-level capability for USAFE and PACAF.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY1993:

1. (U) PROJECT XXX1, Joint Tactical Fusion Program:

(U) FY 1990 Accomplishments:
- (U) Continued supporting Army All Source Analysis System development.
- (U) Completed development of LOCE software version 3.0.
- (U) Conducted Intelligence Correlation Element (ICE) Operational Assessment at USAFE.
- (U) Conducted a study on how to incorporate LOCE into CTAPS.
- (U) Initiated analysis of alternatives to provide USAFE/PACAF with an SCI-level capability on the host platforms.
- (U) Terminated ICE because it did not satisfy operational requirements. Stopped Enemy Situation Correlation Element (ENSCE) development efforts based on changing TAF requirements and reduced budget environments.

(U) FY 1991 Planned Program:
- (U) Develop Phase I implementation of TAFLC for CTAPS.
- (U) Begin correlation processor software modification to open system standards.

Program Element: #0604321F Budget Activity: 4 - Tactical Programs
PE Title: Joint Tactical Fusion Program (JTFP)

(U) FY 1992 Planned Program:
- (U) Complete Phase I CTAPS implementation.
- (U) Continue assessment and begin implementation of USAFE/PACAF SCI-level correlation effort in conjunction with Intelligence Data Handling Systems (IDHS) developments.
- (U) Conduct multiservice testing.
- (U) Continue integrating IDHS upgrades.
- (U) Begin Phase II of TAFLC integration into CTAPS to include a distributed database capability.

(U) FY 1993 Planned Program:
- (U) Complete modification of correlation processor software.
- (U) Integrate system with IDHS upgrades.
- (U) Finish implementing USAFE/PACAF SCI-level correlation effort.
- (U) Complete Phase II of TAFLC integration into CTAPS.

(U) Work Performed By: AFSC/Electronic Systems Division is the Air Force in-house developing organization responsible for the Air Force segment of JTFP.

(U) Related Activities:
(U) Program Element #0603260F, Intelligence Advanced Development.
(U) Program Element #0207431F, Tactical Air Intelligence Systems.
(U) Program Element #0604321A, Army Joint Tactical Fusion Program.
(U) Program Element #0207412F, Tactical Airborne Control System.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: There are no specific cooperative agreements regarding the JTFP. No signed documents exist and no foreign funds are provided to the program office.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604327F Budget Activity: #4 - Tactical Programs
PE Title: Hardened Target Munitions

A. (U) RESOURCES ($ IN THOUSANDS):

BProject Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3273, I-2000 P^3I	6,330	0	7,183	5,919	0	26,953
3311, Boosted Pentrator	0	0	0	0	TBD	TBD
Total	6,330	0	7,183	5,919	TBD	26,953

B. (U) BRIEF DESCRIPTION OF ELEMENT: This PE satisfies the following operational requirements: TAF SON 305-85, Hardened Target Munitions, 14 Oct 86; TAF SON 301-86, Short Range, Precision-Guided, Standoff Surface Attack Weapon, 2 Nov 87; and TAF ROC 21-74, Modular Guided Glide Bomb, 29 Dec 73. TAF SON 305-85 requires the development of munitions capable of destroying various classes of hardened targets. The I-2000 satisfied the requirement for medium hard targets. Integration of this warhead with the GBU-15 and AGM-130 will provide the TAF with a precision-guided capability against this specialized target set. The ability to attack from outside terminal area defenses greatly reduces aircraft attrition. Project 3311 will develop a rocket-boosted penetrator capable of defeating heavily hardened targets to satisfy TAF SON 305-85. Development will begin in FY 94.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 3273, I-2000 P3I: This project integrates the I-2000 (BLU-109/B) warhead with the GBU-15 and AGM-130 weapon systems. The integrated AGM-130/I-2000 will be designated AGM-130C. Cost estimate (mature) based on GBU-15/I-2000 actuals and definitized production options.

(U) FY 1990 Accomplishments:
- (U) Completed BLU-109/B integration into GBU-15 weapon system.
- (U) Completed GBU-15/I-2000 IOT&E and majority of DT&E.
- (U) Made GBU-15/I-2000 production decision.
- (U) Initiated GBU-15/I-2000 kit production.

(U) FY 1991 Planned Program:
- (U) Complete DT&E/SEEK EAGLE testing of GBU-15/I-2000 using remaining FY90 funds.
- (U) Continue GBU-15/I-2000 kit production/deliveries.

Program Element: #0604327F Budget Activity: #4 - Tactical Programs
PE Title: Hardened Target Munitions

(U) FY 1992 Planned Program:
- (U) Award AGM-130/I-2000 FSD contract (70 percent of budget).
- (U) Begin development of AGM-130/I-2000 integration kits.
- (U) Continue GBU-15/I-2000 kit production/deliveries.

(U) FY 1993 Planned Program:
- (U) Conduct AGM-130/I-2000 DT&E/IOT&E.
- (U) Make AGM-130/I-2000 production decision.
- (U) Initiate AGM-130/I-2000 kit production.
- (U) Incorporate horizontal attack capability into AGM-130/I-2000, allowing it to be used effectively against horizontal target surfaces.

(U) Work Performed By: All efforts in this PE are managed by Aeronautical Systems Division at Eglin AFB, FL. Project 3273, I-2000 P3I, Teledyne Brown Engineering (Huntsville, AL) competitively selected in FY 89 for GBU-15/I-2000.

(U) Related Activities:
- (U) PE 0604602F, Armament/Ordnance Development (Fuzing and warhead development)
- (U) PE 0604733F, Surface Defense Suppression

(U) Other Appropriation Funds ($ In Thousands): PE 0208030F, WRM-Ammunition

Project Number & Title	FY 90 Actual	FY 91 Estimate	FY 92 Estimate	FY 93 Estimate	To Complete	Total Program
Other Procurement/ 400	2,531	0	0	0	2,931	
Quantity/ 50	1570	0	0	0	1620	

(U) International Cooperative Agreements: Not applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604408F
PE Title: Advanced Launch System
Program Number: 0001
Budget Activity: #6 - Defense Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Advanced Launch Development Program	81,400	25,000	147,744	251,135	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
DoD Space Policy directs that "assured mission capability" be maintained through complementary strategies of assured access to space, robust satellite control, and both proliferation and survivability of on-orbit assets. The policy further directs pursuit of launch concepts aimed at substantially reducing costs while improving responsiveness, capability, reliability, availability, maintainability, flexibility, and the ability to operate in peace, crisis, and war. Current launch vehicles do not the requirement. Therefore, the Air Force is pursuing the development of an Advanced Launch System (ALS) family of vehicles to perform its mission. The ALS family of vehicles must have the physical capability to lift a multitude of different mission payloads to their operational orbits; it must be responsive to on-orbit force structure deployment and replenishment needs; it must be operable at affordable cost; and for appropriate payloads, it should complement other launch systems to provide more than one means of space access. This need envelops the entire launch infrastructure and includes launch vehicles, upper stages, processing, facilities, logistics support, and maintenance. The ALS family must also support National and Civil launch needs. Elements of the ALS may also support commercial launch needs. The advanced launch development program focuses on the pacesetting technologies required for full scale development of the ALS concept.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) ALS vehicle study contractors updated the system design review (SDR), thereby providing a solid data base for the ALS vehicle design concept. Initial results indicate low-cost, high reliability, robustness objectives are attainable.
   - (U) Several advanced development tasks have reached a demonstration stage with breadboard class or subscale hardware.
     -- (U) The electromechanical actuators (EMA's) program demonstrated subscale motors operating on high-frequency (20 KHz) power at required performance levels.
     -- (U) Progress was made in the development of a precision recovery capability. Six drop tests were successfully completed at Edwards Air Force Base.
     -- (U) The autonomous operations effort provided a breadboard demonstration of a "smart system" that can sense failures, analyze

Program Element: #0604408F
PE Title: Advanced Launch System
Program Number: 0001
Budget Activity: #6 - Defense Wide Mission Support

system needs and adjust to compensate for failed components.
- (U) In the propulsion area, Phase B definition study contracts awarded to three major propulsion contractors (Rocketdyne, Pratt&Whitney and Aerojet) continued and are close to baselining the engine cycle for the 580,000 pound thrust engines.

2. (U) FY 1991 Planned Program:
   - (U) The STME team will complete engine advanced development tasks and initiate the planning for a prototype engine test program with a first engine-fire in the 1997 timeframe.
   - (U) The fabrication of full-scale turbopump and combustion devices will be initiated and the testing of critical sub-components such as turbopump bearings and turbine blade materials and coatings will be initiated using the Stennis Space Center, Component Test Facility.
   - (U) Planning for full-scale development engine test stands at Stennis Space Center will be initiated.
   - (U) Non-propulsion (vehicle) technology activities and the vehicle design efforts are continued.
   - (U) STME engine cycle selection will be completed.

3. (U) FY 1992 Planned Program:
   - (U) Continue advanced developments in propulsion component technologies.
   - (U) Initiate prototype Liquid Hydrogen/Oxygen (LHO) engine development.
   - (U) Start joint full-scale engine component testing.
   - (U) Initiate joint system concept definition design activities.

4. (U) FY 1993 Planned Program:
   - (U) Continue advanced developments in propulsion component technologies.
   - (U) Continue joint development of prototype LHO engine.
   - (U) Continue joint system concept definition and design.

5. (U) Program to Completion:
   - (U) This is a continuing program leading to the development and first engine-fire testing of a Liquid Hydrogen/Oxygen engine in FY 95.
   - (U) Starting in FY 92, the program is to beginning the joint development with NASA of the ALS family of vehicles. The projected first requirement, Space Station, is in FY 1999.

D. (U) Work Performed By: The responsible Air Force agency is the Air Force Systems Command's Space Systems Division at Los Angeles AFB, CA. The program office is a joint DoD/NASA program office (JPO), headed by an Air Force program manager with a NASA deputy. Systems Engineering is provided by the Aerospace Corporation, El Segundo, CA. Advanced Launch Development contractors include: Boeing Aerospace, Seattle, WA (ALS Systems); General Dynamics, Space Systems Division, San Diego, CA (ALS Systems); Martin Marietta Astronautics Group, Martin Marietta Corporation, Denver, CO (ALS Systems); Aerojet TechSystems Company, Sacramento, CA (Propulsion Tasks); Rocketdyne Division, Rockwell International Corporation, Canoga Park, CA (Propulsion Tasks); and Pratt & Whitney, West Palm Beach, FL (Propulsion Tasks).

Program Element: #0604408F
PE Title: Advanced Launch System
Program Number: 0001
Budget Activity: #6 - Defense Wide Mission Support

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: A joint plan is currently under development with NASA for presentation to the National Space Council. This plan will be the guideline for the program which has a first launch requirement for Space Station in FY 1999. Full scale development has been delayed until the first expendable launch vehicle requirement for the Space Station. The joint plan currently in development with NASA will include a new Milestone schedule.

3. (U) COST CHANGES: Increases in FY92 and FY93 put program on full development track, versus descoped technology effort reflected previously.

F. (U) PROGRAM DOCUMENTATION:
- (U) AFSPACECOM SON 005-88 for an Advanced Launch System, dated 12 August 1988.
- (U) AFSPACECOM SORD 005-88-1 for a Military ALS, dated 14 August 1990.

G. (U) RELATED ACTIVITIES:
- (U) Program funding from two other sources: SDIO and NASA.
- (U) Other ELV programs will benefit from the advanced launch development tasks as technologies are transferred to existing ELVs.
- (U) There is no unnecessary duplication of effort within the Air Force, Department of Defense, or National Aeronautics and Space Administration.

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands): Not Applicable.

I. (U) Cooperative Agreements: This program is managed by a joint Air Force/NASA team under an Air Force program manager with a NASA deputy as mandated in the Presidential Report to Congress dated 4 Jan 1988. SDIO involvement is documented in PMA 1505F. Other agreements are MOUs signed with NASA formalizing the use of NASA facilities for propulsion tasks.

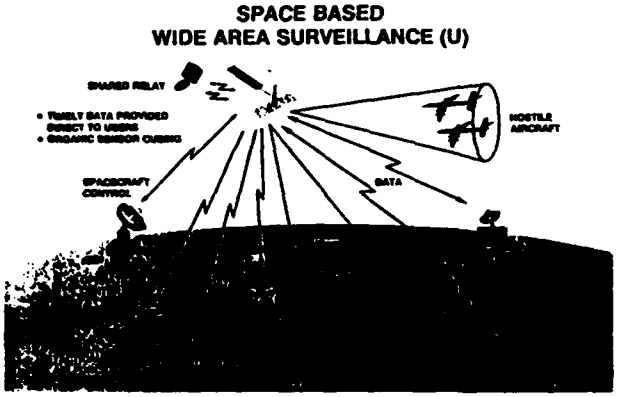
J. (U) MILESTONE SCHEDULE:

1. (U) Completion of MILESTONE 0	November 1988
2. (U) System Design Review (SDR)	July 1988
3. (U) Termination of pre-MILESTONE I activities	December 1989
4. (U) Completion of Engine Concept Definition	June 1991
5. (U) Initiate Engine Prototype Effort	September 1991
6. (U) Initiate Non-propulsion Tasks	October 1993
7. (U) Test-Fire LHO Engine Prototype	May 1997

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604410F Project: #3820
PE Title: Space Based Radar FSD Budget Activity: #3 - Strategic Programs

Project Title: Space Based Wide Area Surveillance (SBWAS)



POPULAR NAME: SBWAS, Space Based Radar (SBR)

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

BUDGET ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Major Contract	0	0	0	13,000	TBD
Support Contract	0	0	0	9,500	TBD
In-House Support	0	0	0	3,500	TBD
GFE/ Other	0	0	0	3,398	TBD
Total	0	0	0	29,398	
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones					Dem/Val- Milestone I
Engnrng Milestones					
T&E Milestones					
Contract Milestones					Dem/Val Contract Award

Program Element: #0604410F Project: #3820
PE Title: Space Based Radar FSD Budget Activity: #3-Strategic Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1993 Planned Program:
   - (U) Conduct competitive source selection and award contracts to develop system concepts and designs.
   - (U) Support cost and operational effectiveness trade off analyses based on most promising wide area surveillance technologies.
   - (U) Develop engagement models to assess overall system performance in support of Joint Cost and Operational Effectiveness Analysis report.
   - (U) Consolidate technology efforts to demonstrate readiness to integrate into a development system.
   - (U) Analyze requirements and develop growth options to support appropriate technology investments.
   - (U) See below for expanded description.

2. (U) Program to Completion:
   - (U) This is a continuing program. After successful completion of concept development, the program will enter demonstration/ validation in FY 96.

D. (U) WORK PERFORMED BY: Air Force program management for this space based surveillance effort is provided by Air Force Systems Command. Concept exploration includes open competitive award to a number of US prime contractors, whom will not be known until source selection occurs and proposals are evaluated. Major in-house work will be performed by The Aerospace Corporation.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: The acquisition executive determined that in order to comply with FY 91 Congressional direction, the Air Force would restructure the FY 92 SBWAS program from an acquisition program to a science and technology effort concentrating on advanced space based radar technology. The work completed under PE 0603428F will transition to PE 0604410F for completion of near and mid term SBWAS concept studies leading to a Milestone I decision, possibly in FY96. Note: When the SBWAS program was restructured to a science and technology effort, PE 0603428F (B) (Space Surveillance Technology) was converted to PE 0603428F (A). Funds from PE 0603428F (B) were transferred to PEs 0603428F (A), 6.1 and 6.2 PEs and 0604410F. Funds currently in PE 0604410F will be used to

Program Element: #0604410F Project: #3820
PE Title: Space Based Radar FSD Budget Activity: 3-Strategic Programs

complete concept exploration and Dem/Val. However, this PE number is inappropriate since it indicates a full scale development effort rather than the planned advanced development effort. Therefore, the Air Force has requested a new PE to support the concept exploration and demonstration/validation acquisition phase of the SBWAS program. When the new PE is approved, funds will be transferred from PE 0604410F to the new PE (tentatively 0603416F). This change will appear in the next descriptive summary cycle.

2. (U) SCHEDULE CHANGES: The last budget request reflected an SBWAS Milestone I decision in FY91 and a Milestone II decision in FY 94. Based on program restructuring and 31 Oct 90 Defense Acquisition Board decision, SBWAS will not meet a Milestone I decision until at least FY96. A Milestone II decision will be delayed correspondingly.

3. (U) COST CHANGES: Due to recent direction to restructure this program, projected program costs have not yet been established.

F. (U) PROGRAM DOCUMENTATION:
- (U) Multi-Command Required Operational Capability (MROC) 2-87
- (U) Mission Need Statement (MNS), JROC-SM-88-083, 28 Nov 88
- (U) SBWAS Combatant Command Requirements (CCRs), 13 Oct 89
- (U) Space Based Atmospheric/Surface Surveillance System SORD, 008-87-I, 23 Apr 90

G. (U) RELATED ACTIVITIES:
- (U) Program Element #0603741D, Air Defense Initiative (ADI)
- (U) Program Element #0603428F, Space Subsystems Technology
- (U) Program Element #0305175F, SBR Production

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: TBD.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: A Data Exchange Agreement (DEA) has been signed with Canada on space based surveillance. A similar Information Exchange Program (IEP) data sharing agreement has been signed with the United Kingdom. Additionally, a memorandum of Understanding (MOU) is in draft between the US and Canada covering cooperative wide area surveillance technology development. This MOU will be negotiated and signed after funding restrictions are lifted by Congress. Canada has an on going space based radar technology program and has identified approximately $1 billion for development and fielding of an operational system.

J. (U) TEST AND EVALUATION DATA: The objectives for Developmental Test and Evaluation (DT&E) through the Dem/Val phase will be to ensure critical technology approaches selected are capable of meeting or exceeding all required system characteristics. T&E activity has not yet been scheduled.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604601F Budget Activity: #4 - Tactical Programs
PE Title: Chemical/Biological Defense Equipment

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3321 Chemical and Biological Agent Detection and Warning	0	0	300	300	Cont	TBD
3337 Individual Protection	6,782	8,275	12,441	15,580	Cont	TBD
3762 Collective Protection	0	0	0	0	Cont	TBD
3764 Decontamination	0	0	0	0	Cont	TBD
Total	6,782	8,275	12,741	15,880	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program develops systems to detect, warn against, and protect personnel and equipment from a chemical/biological environment and provide a critical deterrent to use of chemical/biological weapons. Without these protective systems, sortie generation on a sustained basis will be degraded significantly.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 3321, Chemical/Biological Agent Detection and Warning: Develops detectors to warn personnel of chemical attack.

(U) FY 1990 Accomplishments: (FY89 funds)
- (U) Continued to monitor Army efforts to develop their Advanced Chemical Agent Detector/Alarm and the Remote Sensing Chemical Agent Alarm.
- (U) Continued Armstrong Aerospace Medical Research Lab (AAMRL/HET) efforts to provide threat scenarios and technical/analytical assistance in support of a Fixed Site Chemical Detection and Warning System (FSDWS).

(U) FY 1991 Planned Program: Not Applicable.

(U) FY 1992 Planned Program:
- (U) Initiate Radiological and Biological Detector/Operational Capability study.

Program Element: #0604601F Budget Activity: #4 - Tactical Programs
PE Title: Chemical/Biological Defense Equipment

(U) FY 1993 Planned Program:
- (U) Continue Radiological and Biological Detector/Operational Capability study.

(U) Work Performed By: Work has been performed by Calspan, Buffalo NY; and by task order contract with JAYCOR, Dayton OH, through the Armstrong Aerospace Medical Research Laboratory (AAMRL/HET), Wright-Patterson AFB OH. In-House development organizations responsible for elements of the program are the Human Systems Division, Brooks AFB TX; Aeronautical Systems Division, Wright-Patterson AFB OH; and the Aeronautical Systems Division, Eglin AFB FL.

(U) Related Activities:
- (U) Program Element #0207593F, Chemical Biological Defense Program.
- (U) Program Element #0602202F, Aerospace Biotechnology.
- (U) Program Element #0603231F, Crew Systems Technology.
- (U) Program Element #0604617F, Air Base Operability
- (U) Program Element #0604703F, Aeromedical Chemical Defense System Development.
- (U) Program Element #0603806A, Chemical/Biological Defense Equipment Advanced Development.
- (U) Program Element #0603514N, Ship Survivability.
- (U) Program Element #0604506N, Biological/Radiological/ Chemical Warfare Countermeasures.
- (U) Program Element #0603635M, Marine Corps Ground Combat/Support Arms.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in thousands):
- (U) Other Procurement: (BA 4)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Chemical Agent Monitor	0	7,697	0	0	Continuing	TBD

(U) International Cooperative Agreements: Not applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604601F Project Number: 3337
PE Title: Chemical/Biological Defense Equipment Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3337 Individual Protection	6,782	8,275	12,441	15,580	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Based upon changing world conditions, chemical/biological weapons have emerged as a major threat to our forces. Because of this, the using commands have issued operational requirements to protect personnel against agents while minimizing the impact to their performance. The Air Force is developing clothing and equipment (both aircrew and groundcrew) to protect personnel in chemical /biological environments.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Continued Aircrew Eye/Respiratory Protection (AERP)
     -- Completed Functional Configuration Audits (FCA) for Tactical Aircrew Eye/Respiratory System (TAERS), Protective Integrated Hood Mask (PIHM), Blower, Comm unit, and KC-135, MH-53J, C-130, and AC-130 mod kits.
     -- Completed Initial Operational Test and Evaluation (IOT&E) of the PIHM for the KC-135.
     -- Exercised limited production of PIHM for the KC-135.
     -- Conducted F-16/Sled test for the ejection seat interface.
     -- Initiated IOT&E of the TAERS on the F-16.
     -- Initiated DT&E/IOT&E of the PIHM on the C-9A and C-130.
     -- Initiated development of a passive antidrown system for ejection over water.
   - (U) Completed reprocurement package on the improved Aircrew Ensemble (A/C Ens) (CWU-66/P).
   - (U) Initiated evaluation study for a Disposable Eye/ Respiratory Protection (DERP) nondevelopment item.

2. (U) FY 1991 Planned Program:
   - (U) Initiate DT&E/IOT&E of the AERP for the AC-130, MH-53, B-1B, and B-52. Slipped from 1990 because aircraft unavailable due to operation Desert Shield.
   - (U) Complete IOT&E and make a limited production decision on AERP for the F-16, C-9A, C-130, AC-130, and MH-53.
   - (U) Begin program management responsibility transfer of PIHM to San Antonio Air Logistics Center.

Program Element: #0604601F Project Number: 3337
PE Title: Chemical/Biological Defense Equipment Budget Activity: #4 - Tactical Programs

3. (U) FY 1992 Planned Program:
   - (U) Continue AERP DT&E/IOT&E for the B-52 and B-1B.
   - (U) Make a limited production decision on AERP for the B-52 and B-1B.
   - (U) Award contract for Groundcrew Ensemble (G/C Ens)

4. (U) FY 1993 Planned Program:
   - (U) Continue AERP mod kit development and mission support.
   - (U) Continue G/C Ens development and begin IOT&E.
   - (U) Award contract for DERP.
   - (U) Begin full scale AERP/COMBAT EDGE integration.

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

D. (U) WORK PERFORMED BY: Work is performed by Boeing Advanced Systems Company, Seattle WA, and Celanese Corp., Charlotte NC. In-House development organizations responsible for elements of the program are the Human Systems Division, Brooks AFB TX; Aeronautical Systems Division, Wright-Patterson AFB OH; and Aeronautical Systems Division, Eglin AFB FL.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: The Tactical Aircrew Eye/Respiratory System (TAERS) was discontinued following completion of IOT&E. Oxygen consumption rates were unaceptable to HQ TAC and a decision was made to use the Protective Integrated Hood Mask (PIHM) in fighter/attack aircraft. Efforts to qualify the PIHM in high G fighter environment were initiated. This effort was expedited in response to DESERT SHIELD/STORM. Qualification efforts are now complete and associated aircraft modification kits are being designed, with some design completed.

2. (U) SCHEDULE CHANGES: The schedule has been accelerated because of DESERT SHIELD/STORM. Air Logistics Centers have taken responsibility for aircraft modification kit design for their respective aircraft.

3. (U) COST CHANGES: Funding availabiliity for the AERP program has increased in response to DESERT SHIELD/STORM requirements. Funding was directed from other CWD projects.

F. (U) PROGRAM DOCUMENTATION:
   (U) USAF SON 004-85, Sustained Operations in a Chemical/Biological Environment, 19 Sep 86.
   (U) TAF (USAF 004-85)-I/II-C, Chemical/Biological Protective Overgarment, 11 May 89.

Program Element: #0604601F Project Number: 3337
PE Title: Chemical/Biological Defense Equipment Budget Activity: #4 - Tactical Programs

G. (U) RELATED ACTIVITIES:
- (U) Program Element #0207593F, Chemical Biological Defense Program.
- (U) Program Element #0602202F, Aerospace Biotechnology.
- (U) Program Element #0603231F, Crew Systems Technology.
- (U) Program Element #0604617F, Air Base Survivability.
- (U) Program Element #0604703F Aeromedical Chemical Defense System Development.
- (U) Program Element #0603806A, Chemical/Biological Defense Equipment Advanced Development.
- (U) Program Element #0604806A, Chemical/Biological Defense Equipment Development.
- (U) Program Element #0603514N, Ship Survivability.
- (U) Program Element #0604506N, Biological Radiological/ Chemical Warfare Countermeasures.
- (U) Program Element #0603635M, Marine Corps Ground Combat/Support Arms.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:
(U) Other Procurement: (BA 4)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
AERP	16,637	13,914	10,241	8,015	Continuing	TBD
A/C Ens	0	0	5,000	6,696	Continuing	TBD

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

1. (U) Aircrew Eye/Respiratory Protection (AERP) Mask

First Hardware Delivery	Jan 91
Physical Configuration Audit	Mar 91
Program Management Responsibility Transfer	Sep 91
Complete Anti-Drown Device Development	Jul 92

2. (U) AERP Modifications

Complete DT&E/IOT&E for B-52, B-1B	Nov 91
Complete Modification kit development for support aircraft and helicopters	Apr 92

3. (U) Ground Crew Uniform

Contract Award	Aug 92
First Article Test	Jul 94
Start Production Delivery	Sep 94

4. (U) Disposable Eye/Respiratory Protection (DERP)

Contract Award	Dec 92
First Article Test	Nov 94
Start Production Delivery	Jan 95

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604602F Budget Activity: #4 -Tactical Programs
PE Title: Armament/Ordnance Development

A. (U) RESOURCES ($ In Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2586, Airfield Attack Munition (AAM)(Formerly Direct Airfield Attack Combined Munition (DAACM))	994	0	0	0	0	15,990
2784, Armament Standardization/Control/Munitions Materiel Handling Equipment (MMHE)	650	158	2,330	1,619	Cont	TBD
3133, Bombs and Fuzes	951	300	800	1,284	Cont	TBD
3664, Have Stamp	688	0	0	0	0	7,634
4003, Adverse Terrain Ammunition Assembly Trailer/Adverse Terrain Tow Vehicle (ATAAT/ATTV)	0	0	0	2,085	Cont	TBD
5613, Containers	929	100	1,682	1,157	Cont	TBD
Total	4,212	558	4,812	6,145	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Armament Control, Munitions Material Handling Equipment (MMHE), and Container Design Retrieval System (CDRS) projects satisfy several USAF and tri-service requirements for standardization of armament and support equipment. Bombs and Fuzes satisfies TAF ROC 323-75, Proximity Fuzes, dated 2 Sep 75; TAF SON 305-85, Hardened Target Munitions, dated 14 Oct 86; and an OSD letter requirement for a common bomb fuze, dated 11 Apr 80. The Direct Airfield Attack Combined Munition (DAACM) program was terminated at the end of FY 90. Further budget reductions in FY 91 cut remaining programs to the minimum. FY 92 funding is restored to a level adequate to meet program objectives.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2784, Armament Standardization/Control/MMHE: This continuing project funds the Directorate of Armament Control (DAC) and the Munitions Material Handling Equipment (MMHE) Focal Point. The DAC conducts activities to improve standardization and commonality in Air Force armament systems in order to preclude duplication and proliferation and serves as the USAF liaison to Joint Technical Coordinating Group (JTCG) for

Program Element: #0604602F Budget Activity: #4 -Tactical Programs
PE Title: Armament/Ordnance Development

Munitions Development. The MMHE Focal Point ensures development of improved munitions handling equipment and is responsible for precluding proliferation and duplication of handling equipment. Funding increase in FY 92 is required to prototype, test, and develop the MJ-1 Stacking Fixture, hardened aircraft shelter munitions racks, and the B-52 Heavy Stores Adapter Beam.

(U) FY 1990 Accomplishments:
- (U) Issued Technical Engineering Acquisition Support/Technical Engineering Acquisition Management Support (TEAS/TEAMS) contract. (Provides engineering analysis and functional support to program offices.)
- (U) Supported the SA-ALC Automatic Weapon Electrical System Test (AWEST) program for next generation aircraft and stores to ensure 1760 tester compatibility.
- (U) Supported the AFATL missile modular development program (Common Ada Missile Package [CAMP 3]).
- (U) Conducted next generation bomblift market survey.
- (U) Hosted and funded Worldwide MMHE Conference.
- (U) Developed prototypes for the M-10 Missile Adapter, Universal Wing and Fin Rack, Jammer Tow Trailer, and MHU-110 Expanded Load Trailer.
- (U) Conducted High Gear SAC pylon lifter adapter evaluation for B-52G.

(U) FY 1991 Planned Program:
- (U) Continue TEAS/TEAMS support contract.
- (U) Conduct feasibility studies on future MMHE improvements, including a next generation bomblift.
- (U) Host and fund Worldwide MMHE Conference.
- (U) Field Universal Wing and Fin Rack and M-10 Missile Adapter.
- (U) Support development of Universal Ammunition Loading System (UALS).

(U) FY 1992 Planned Program:
- (U) Support development of the MJ-1 Stacking Fixture.
- (U) Prototype, test, and field hardened aircraft shelter racks.
- (U) Develop, prototype and test Heavy Stores Adapter Beam for B-52G/H.
- (U) Support MHU-173 Munitions Lift Trailer (MLT) modification to MHU-204 MLT in support of B-2.
- (U) Continue TEAS/TEAMS support contract.
- (U) Provide logistics/engineering assistance to the Standard Automotive Engineering (SAE) society for the further development and growth of MIL-STD-1760.
- (U) Continue to support MAJCOMs, Systems Program Offices (SPOs), and Air Logistics Centers (ALCs) in combat initiatives.
- (U) Continue implementation of MIL-STD-1760A as the SAF/AQ Implementing Control Agent.
- (U) Conduct feasibility studies on container handling equipment.
- (U) Assume responsibility for Director of Armament Control (DAC) funding.

Program Element: #0604602F Budget Activity: #4 -Tactical Programs
PE Title: Armament/Ordnance Development

(U) FY 1993 Planned Program:
- (U) Continue TEAS/TEAMS support contract.
- (U) Continue technical assessments of MAJCOM munitions workforce capabilities.
- (U) Continue developing and maintaining MIL-STD-1760A/B database of all aircraft armament type stores.
- (U) Incorporate robotics into MMHE.
- (U) Complete Hardened Aircraft Shelter Racks.
- (U) Research new generation handling, storing, and loading equipment for future operations.
- (U) Continue DAC funding.
- (U) Develop, prototype and test Heavy Stores Adapter Beam for B-52G/H.
- (U) Support MHU-173 Munitions Lift Trailer (MLT) modification to MHU-204 MLT in support of B-2.
- (U) Support MJ-1 Stacking Fixture.

(U) Work Performed By: Program is managed by Aeronautical Systems Division at Eglin AFB, FL.

(U) Related Activities: None.

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3133, Bombs and Fuzes: This project develops and improves conventional bombs and fuzes.

(U) FY 1990 Accomplishments:
- (U) Conducted IOT&E of the M-117/BSU-85/B.
- (U) Demonstrated alternative hard target fuzes.
- (U) BSU-85/B production decision made Sep 90.
- (U) Conducted High Gear SAC delay fuze feasibility analysis.

(U) FY 1991 Planned Program:
- (U) Continue tests of an improved hard target fuze for use with existing penetrating weapons.
- (U) Plan for FY 92 production award of BSU-85/B/M-117 and ADU-656.
- (U) Procure High Gear SAC delay fuze.
- (U) Test high drag proximity sensor candidates for application in general purpose bombs with low altitude delivery. The selected proximity sensor will be evaluated for development and production.

(U) FY 1992 Planned Program:
- (U) Production contract award for BSU-85/B/M-117, and ADU-656.
- (U) Initiate development of selected high drag proximity sensor.

Program Element: #0604602F Budget Activity: #4 -Tactical Programs
PE Title: Armament/Ordnance Development

(U) FY 1993 Planned Program:
- (U) Perform concept studies for a programmable electronic bomb fuze for penetrator application.
- (U) Continue production of BSU-85/B, M-117, and ADU-656.

(U) Work Performed By: Program is managed by Aeronautical Systems Division at Eglin AFB, FL. Contractors TBD. Programmable Electronic Fuze contractor(s) TBD (FY 94 new start).

(U) Related Activities: None.

(U) Other Appropriation Funds ($ in Thousands): PE #0208030F, WRM - Ammunition

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Procurement/	0	0	15,691	5,285	5,547	26,523
Quantity/	0	0	16341	5303	5422	27066

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 4003, Adverse Terrain Ammunition Assembly Trailer/Adverse Terrain Tow Vehicle ATAAT/ATTV: This project will develop a munitions assembly trailer and tow vehicle capable of transporting and assembling munitions in support of sortie generation at damaged or bare base airfields.

(U) FY 1990 Accomplishments:
- (U) Off-the-shelf technology concepts analyzed as part of SBIR effort.
- (U) TAF is refining requirements based on demonstration performance.

(U) FY 1991 Planned Program:
- (U) Phase II SBIR program to develop two modification kits for TAF demonstration.

(U) FY 1992 Planned Program:
- (U) Funding zeroed. Pre-FSD planning for ATAAT/ATTV FY 93 new start.

(U) FY 1993 Planned Program:
- (U) New Start will initiate capability development with at least one FSD contractor.

(U) Work Performed By: Program is managed by Aeronautical Systems Division at Eglin AFB, FL. Contractor(s) TBD (FY 93 new start).

(U) Related Activities: None.

Program Element: #0604602F Budget Activity: #4 -Tactical Programs
PE Title: Armament/Ordnance Development

(U) Other Appropriation Funds ($ in Thousands): PE #0208030F, WRM - Ammunition.

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Procurement/	0	0	0	0	181,502	181,502
Quantity/	0	0	0	0	3944	3944

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 5613, Containers: This project funds operation of the tri-service Container Design Retrieval System (CDRS) which includes maintenance of a container database to preclude proliferation and duplication of munitions containers.

(U) FY 1990 Accomplishments:
- (U) Saved $6.8M through reuse of surplus DoD containers and designs.
- (U) Upgraded CDRS data base for increased operating efficiency.
- (U) Designed and developed containers for Marine Corps SMAW, TACIT RAINBOW, AGM-45, Navy Launcher, AGM-130, etc.

(U) FY 1991 Planned Program:
- (U) Design and develop specialized munitions containers.
- (U) Operate and maintain CDRS database.
- (U) Continue effort to save DoD funds by identifying/reusing DoD containers, such as AMRAAM, SAIP, HISAC, MILSTAR, HAVE NAP, Penetrator Bomb Kit, etc.

(U) FY 1992 Planned Program:
- (U) Design and develop specialized munitions containers.
- (U) Promote standardization of specialized munitions containers.
- (U) Operate and maintain CDRS database.
- (U) Continue effort to save DoD funds by identifying/reusing DoD containers.

(U) FY 1993 Planned Program:
- (U) Develop munitions containers
- (U) Maintain CDRS database.
- (U) Continue effort to save DoD funds by identifying/reusing DoD containers.

(U) Work Performed By: Program is managed by Aeronautical Systems Division at Eglin AFB, FL.

(U) Related Activities: PE #0603601F, Conventional Weapons

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604604F Budget Activity: # 4 - Tactical Programs
PE Title: Submunitions

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3166 Joint Smart Munitions Test and Evaluation Program						
	6,814	7,528	5,082	8,009	Cont	TBD
Total	6,814	7,528	5,082	8,009	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Project 3166 commonly known as "Chicken Little" is a joint US Air Force/US Army project which evaluates developmental smart munitions and related emerging technology with applications against mobile ground vehicle targets by determining antiarmor/counter-battery munition performance against actual foreign targets in realistic environments and in the presence of countermeasures. Originally formed to assist development of "top attack" smart munitions, the project has broadened to reduce developmental risk for all smart munitions designed to attack mobile targets. The project leverages technology, joint experience, and test and evaluation dollars to Air Force, Army, and Navy during early and mid-term system development efforts in this area. Data gathered is also used to meet developmental decision points requiring highly reliable, realistic performance data. The project is a major focal point for joint Air Force and Army target signature collection and dissemination for developmental and exploitation purposes. Armor and other mobile tactical targets required to evaluate seeker/sensor performance, model target vulnerability, support signature evaluation, have been acquired under this project.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH 1992 AND FY 1993:

1. (U) Project 3166, Joint Smart Munitions Test and Evaluation Program: Evaluate munition performance against fixed/mobile ground targets.

(U) FY 1990 Accomplishments:
- (U) Conducted Captive Flight Tests (CFT) of seeker/sensors in snow and desert conditions including twelve participants from AF and Army program offices against the Chicken Little target array (with and without countermeasures).
- (U) Conducted warhead firings against armored targets (with and without countermeasures) to determine warhead effectiveness including penetration and behind-armor effects.
- (U) Completed Sensor Fuzed Weapon (SFW) Live Fire Testing and started analysis of results.

Program Element: # 0604604F Budget Activity: # 4 - Tactical Programs
PE Title: Submunitions

- (U) Supported Joint Tactical Coordinating Group (JTCG) in interdiction-kill (I-Kill), standard damage assessment lists (SDAL), and lightly armored fighting vehicles vulnerability (LAFV) analysis and warhead characterization activities.
- (U) Continued support of weapons systems development through analysis of the effectiveness of seeker/sensor and warhead combinations and supplying data and analysis to support program office and higher level decisions and milestones.
- (U) Continued evaluation of developmental seeker/sensors and warheads.

(U) FY 1991 Planned Program:
- (U) Continue Phase II Captive Flight Tests (CFT) to determine the effectiveness of seeker/sensors against actual Soviet combat vehicles (with and without countermeasures).
- (U) Conclude current warhead effectiveness analysis, complete analysis of Sensor Fuzed Weapon Live Fire Tests, and continue vulnerability analysis.
- (U) Continue support of Joint Tactical Coordinating Group (JTCG), LAFV, signature collection, and simulator validation activities.
- (U) Continue support of weapon system development program office efforts; identify seeker/sensors and warheads for the next series of CFT and Warhead Effectiveness Tests.

(U) FY 1992 Planned Program:
- (U) Initiate Phase III program with focus on countermeasures.
- (U) Continue seeker/sensor evaluations and analysis, select the next generation of seeker/sensors and warheads for evaluation, and conduct CFT.
- (U) Continue warhead effectiveness tests, continue support to AF and Army program offices, continue vulnerability analysis of new targets.
- (U) Continue support of JTCG and AF/Army program offices in signature collection/analysis, and simulator validation as new assets become available.

(U) FY 1993 Planned Program:
- (U) Initiate CFT with new seeker/sensors against the Chicken Little Target Set in various climatic settings.
- (U) Continue warhead effectiveness activities and vulnerability analysis activities, continue evaluation of future warheads.
- (U) Continue support of JTCG and AF/Army programs offices.

(U) Work Performed By: Program management is provided by the Air Force Development Test Center (AFDTC), Eglin Air Force Base Fl. Program office is jointly manned by Army and Air Force personnel. Contractors include Textron Defense Systems, MA; Aerojet, CA; and Martin Marietta, FL.

Program Element: # 0604604F Budget Activity: # 4 - Tactical Programs
PE Title: Submunitions

(U) Related Activities:
- (U) PE 0604607F, Wide Area Antiarmor Munitions (Sensor Fuzed Weapon (SFW)).
- (U) PE 0603628A, Field Artillery Ammunition Dev.
- (U) PE 0604631A, Field Artillery Ammunition.
- (U) PE 0605807A, Munitions Standardization, Effectiveness and Safety.
- (U) Memorandum of Agreement between USAF AFDTC and USA MICOM, TACOM, ARDEC, MSAA, SWMO, BRL, and TRADOC for Chicken Little II.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604607F Budget Activity: # 4 - Tactical Programs
PE Title: Wide Area Antiarmor Munitions

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2961 Sensor Fuzed Weapon	24,945	23,665	0	0	0	200,949
Total	24,948	23,665	0	0	0	200,949

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Tactical Air Forces require a capability to destroy multiple enemy tanks and other armored vehicles during a single aircraft pass. This need is documented in the Mission Element Need Statement for an Improved Wide Area Antiarmor Capability. The Sensor Fuzed Weapon (SFW) program is an outgrowth of the Wide Area Antiarmor Munition program. This program element accomplishes full scale development of SFW.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2961 Wide Area Antiarmor Munition: Develop and test the Sensor Fuzed Weapon.

(U) FY 1990 Accomplishments:
- (U) Conducted 22 DT&E and 2 contractor qualification flight tests.
- (U) Started IOT&E and Live Fire testing: Conducted 6 IOT&E drops and 19 Live Fire shots.
- (U) Started SEEK EAGLE ballistic testing: Conducted 41 drops from F-16 aircraft.
- (U) Began Production Transition Program (PTP): Identified and studied improved production and inspection processes.

(U) FY 1991 Planned Program:
- (U) Complete Live fire testing, Air Force DT&E, and F-16 SEEK EAGLE testing.
- (U) Conduct safe jettion, bullet impact, fast cookoff, and projectile reliability tests.
- (U) Continue IOT&E: 24 IOT&E flight test drops remaining.
- (U) Continue Production Transition Program: Define improved processes and producibility enhancements.
- (U) Start Multi-Stage Improvement Program (MSIP) trade study analysis.
- (U) Conduct final Production Readiness Review (PRR).
- (U) Conduct Functional Configuration Audit (FCA).

Program Element: # 0604607F Budget Activity: # 4 - Tactical Programs
PE Title: Wide Area Antiarmor Munition

(U) FY 1992 Planned Program:
- (U) Complete IOT&E.
- (U) Complete Production Transition Program.
- (U) Begin Low Rate Initial Production.

(U) FY 1993 Planned Program:
- (U) Initiate second source effort.

(U) Work Performed By: Program management is provided by the Aeronautical Systems Division, Eglin Air Force Base FL. Prime contractor for the Sensor Fuzed Weapon (SFW) is Textron Defense Systems, Wilmington, MA.

(U) Related Activities:
- (U) SFW demonstration/validation was accomplished in PE 0603609F.
- (U) Some early portions of SFW FSD were accomplished in PE 0604604F.
- (U) The Live Fire Tests was done by the Chicken Little Project, PE 0604604F. Funding was provided by SFW (PE 0604607F).
- (U) PE 0605712F, AF Operational Test & Evaluation funded IOT&E beginning in FY91.
- (U) PE 0207590F, SEEK EAGLE will certify SFW on all aircraft after the initial F-16 certification.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):
- (U) In FY 91, Army provided $10 million for ammunition plant facilitization.

- (U) Procurement, PE 0208030F (BA 4, P-1 Line Item 23):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	0	0	95703	252639	2961258	3309600
Qty	0	0	98	232	16396	16726

(U) Military Construction: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604609F
PE Title: Reliability & Maintainability Technology Insertion Program (RAMTIP)
Project Number: N/A
Budget Activity: #6-Defense Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Title RAMTIP

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
RAMTIP	19,026	16,969	20,999	24,890	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: RAMTIP was formed in 1987 by the AF Chief of Staff to improve the reliability and maintainability of fielded, in-production, and future USAF systems by accelerating the development and transition of emerging, high-leverage technologies from the laboratory to the implementation phase in keeping with the tenets of the USAF R&M 2000 program. RAMTIP has 13 active projects with projected returns on investment of at least 6:1.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Completed development and installation of the Automatic Rocket Nozzle Inspection System (ARNIS). Using CAT-Scan technology, ARNIS will significantly reduce production costs and increase R&M through early, comprehensive fault detection in composite material missile nozzles and exit cones.
   - (U) C-130 Electronic Cockpit test aircraft modification completed. Project replaces 60 analog instruments with five thin plate, liquid crystal displays. upon implementation, availability of the C-130 fleet will increase by 4% (equivalent to 13 additional aircraft), and increase intratheater airlift capability by 230 tons per day.
   - (U) F-16 Frameless Canopy project accelerated. Frameless canopy design integrates processing and birdstrike inputs for the first time. The new canopy design will significantly reduce replacement time/aircraft downtime, have superior damage-resistance capabilities, and be less expensive to procure.

2. (U) FY 1991 Planned Program:
   - (U) Development of the Laser Ultrasonic Inspection System for both conventional and composite aircraft. Will allow inspection of new manufactured parts/assemblies or entire aircraft that current nondestructive inspection systems can't handle. Will reduce inspection times by 75% and maintenance costs by over $ 540K/year.

Program Element: #0604609F
PE Title: Reliability & Maintainability Technology Insertion Program (RAMTIP)
Project Number: N/A
Budget Activity: #6-Defense Wide Mission Support

- (U) Fuel Cell Power for Ballistic Missile Launch Sites. Will demonstrate the use of "fuel cell" technology developed for orbital vehicles in a ground-based system. Will reduce operating costs, significantly decrease pollutant emissions, and will improve launch site reliability parameters.
- (U) Technology for Autonomous Operational Survivability (TAOS). A project to develop, test, and validate autonomy and survivability technology in orbital spacecraft operations. This will increase durability of space systems and reduce life cycle costs due to decreased dependence on ground station monitoring and associated logistics costs.

3. (U) FY 1992 Planned Program:
- (U) Low Observable Antenna Integration project. Integrates the functions of several antennas into one while employing low observable emerging technology. Significant cost, weight, and maintenance improvements are expected.
- (U) The Universal Water-Activated Release System automatically releases an aviator's parachute harness upon submersion in water. The new system will have a maintenance-free, 20 year shelf-life and will eliminate R&M issues of the current system.
- (U) B-2 Windshield. This classified project will incorporate technologies employing metallic-polycarbonates to integrate flash-shielding, and electromagnetic pulse protection in full-size transparencies. Eliminates the need for cumbersome, labor-intensive separate systems as used today.
- (U) Life-of-the-Aircraft Battery. State-of-the-art computer controlled multi-cell batteries which will eliminate base-level battery shops altogether. Tailored to the high-current start requirements, and environmental extremes of aircraft operations world-wide. Will delete all battery maintenance requirements.

4.(U)FY 1993 Planned Program:
- (U) Radome Paint Stripping project. Will develop a method of stripping composite radomes without damaging the substrate. Flashlamp technology will be employed for the first time. Will significantly reduce rework costs associated with current eroding/corrosive paint removal systems.
- (U) Lightweight Spacecraft Antenna project. Will produce an antenna system that is one-third the weight of present antennas while increasing its resistance to jamming, and its ability to service more users. Will decrease the cost of launching, maneuvering, and maintaining satellite orbits.
- (U) Electromagnetic Deposition project. Will develop a deposition plating process for turbine engine components using rail gun technology. Will allow turbine blades to be plated with low heat input, and virtually no distortion. Increased reliability of plated components and increased depot maintenance throughput will result.

Program Element: #0604609F
PE Title: Reliability & Maintainability Technology Insertion Program (RAMTIP)

Project Number: N/A
Budget Activity: #6-Defense Wide Mission Support

- (U) Laser Ordnance Initiation System. Will couple the emerging technologies of lasers and fiber-optics. Initial objective is to use this new combination in the F-16 crew escape system for crew ejection. Wide application of the technology to improve reliability and reduce maintenance labor is anticipated.

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

D. (U) WORK PERFORMED BY: RAMTIP is located at Wright-Patterson AFB, OH. Other invcolved organizations are: HQ USAF; HQ Air Force Systems Command (AFSC), Andrews AFB MD; AFSC Product Divisions and Labs; HQ Air Force Logistics Command (AFLC), Wright-Patterson AFB OH; and the AFLC Air Logistics Centers. The largest participating contractors are: McDonnell-Douglas, St. Louis MO; McDonnell-Douglas, Long Beach CA; Aerojet General, Sacramento CA; Boeing Military Airplane Company, Wichita KS; and Lockheed Aircraft Systems, Marietta GA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: None
3. (U) COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION: Not Applicable

G. (U) RELATED ACTIVITIES:
   (U) Productivity, Reliability, Availability & Maintainability Program, (PE 0708026F)
   (U) All RAMTIP projects are closely coordinated with the AF laboratories to preclude duplication of effort and to take advantage of technology advances emanating from the laboratory environment.
   (U) All RAMTIP projects are reviewed for potential Army/Navy interest, and dialogue is established in cases where commonality of problems exist such that solutions become DoD-wide.
   (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604617F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability

A. (U) RESOURCES ($ in Thousands)

Project nNumber & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2621 Rapid Runway Repair	634	500	3,333	4,514	Cont	TBD
2895 Air Base Operability	8,075	5,892	4,237	5,135	Cont	TBD
3141 Camouflage, Concealment, and Deception	2,100	62	100	50	Cont	TBD
4057 Survivable Airbase Utility Systems	0	0	2,500	4,000	Cont	TBD
4058 Advanced Firefighting	0	0	0	1,300	Cont	TBD
Total	10,809	6,454	10,170	14,999	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program integrates numerous ongoing efforts and provides for full-scale development of selected air base operability (ABO) systems. Sustained airfield operations are a prerequisite for a successful air campaign. Base and theater commanders must have the capability and resources to defend their main or forward airfields and to return them to operational status after sustaining an attack.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2621, Rapid Runway Repair (RRR): This full-scale development program develops the technology, procedures, and equipment to rapidly repair large, deep craters in runways and taxiways as well as smaller, pothole-sized craters caused by enemy munitions.

(U) FY 1990 Accomplishments:
- (U) Completed Initial Operational Test & Evaluation (IOT&E) of Folded Fiberglass Mats (FFM) and initiated production.
- (U) Completed testing of asphalt anchor for FFM.
- (U) Continued to test new materials for runway repair suitability.
- (U) Continued evaluation of United Kingdom Flood Grout System for crater and spall repair.

Program Element: #0604617F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability

- (U) Completed Repair Quality Criteria (RQC) analysis and documentation for fighter aircraft to enable operation over minimum quality repairs.
- (U) Supported polymer clean up efforts.
- (U) Tested and decided to produce Distance-To-Go minimum operating strip (MOS) markers. Continued testing paint machine and edge markers.
- (U) Continued evaluation of compaction methods of reducing upheaval.

(U) FY 1991 Planned Program:
- (U) Decide on suitability of Flood Grout system for advanced Rapid Runway Repair system.
- (U) Buy Distance-To-Go MOS markers. Test and decide on production of paint machine and edge markers.
- (U) Begin development of RQC for KC-135.
- (U) Begin development of advanced crater capping techniques.

(U) FY 1992 Planned Program:
- (U) Continue development of RQC for KC-135.
- (U) Begin development of RQC for KC-10.
- (U) Begin development of Alternate Launch and Recovery Service (ALARS) repair techniques.
- (U) Begin development of FFM tailhook compatibility advanced repair techniques.
- (U) Complete development of advanced crater capping techniques.

(U) FY 1993 Planned Program:
- (U) Continue development of RQC for KC-135 and KC-10.
- (U) Begin development of a repair capability that can be used for small craters (spalls) caused by either 30 mm cannon strafing or anti-runway submunitions.
- (U) Continue FFM tailhook compatibility advanced repair techniques.
- (U) Continue development of ALARS repair techniques.

(U) Work Performed By: Program contractor is BDM MSC, Panama City FL. The in-house development organizations responsible for elements of the program are the Air Force Engineering and Services Center, Tyndall AFB FL; Aeronautical Systems Division, Eglin AFB FL; and the Air Force Weapons Laboratory, Kirtland AFB NM.

(U) Related Activities:
- (U) This project transitions advanced development efforts in:
- (U) Program Element #0602206F, Civil Engineering & Environmental QA
- (U) Program Element #0603307F, Air Base Operability Advanced Development
- (U) Program Element #0603723F, Civil/Environmental Engr Tech
- (U) Procurement is executed through:
- (U) Program Element #0207596F, Base Operations, Tactical Air Forces.

Program Element: #0604617F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability

- (U) Program Element #0401896F, Base Operations.
- (U) Program Element #0702896F, Base Operations (Logistics).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in thousands):
- (U) Other Procurement: (BA 4)

FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
RRR Kits					
17,700	3,900	10,300	10,900	Cont	TBD

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2895, Air Base Operability: Air Base Operability integrates operational concepts to improve sortie generation capability should an attack occur on or close to an air base.

(U) FY 1990 Accomplishments:
- (U) Completed Mobile Armored Reconnaissance Vehicle/Standoff Munitions Disruptor (MARV/SMUD) development and test.
- (U) Continued development of the Survivable Base Recovery After Attack (BRAAT) Communication System (SBCS).
- (U) Redesigned and retested M-60 tank Oracle blade for clearing sub-munitions off runways.
- (U) Plan system critical design review (CDR) for Contingency Airfield Lighting System (CALS) in Sep 90.

(U) FY 1991 Planned Program:
- (U) Complete FSD and IOT&E for the SBCS.
- (U) Complete CALS FSD and IOT&E, exercise CALS first production option.
- (U) Support of M-60 tank refurbishment contract.
- (U) Analyze suitability of M-113 for Explosive Ordnance Disposal/Civil Engineering ABO use.
- (U) Support Armored Response Multi-Role Vehicle (ARMRV) Evaluation.

(U) FY 1992 Planned Program:
- (U) Accomplish CALS program management responsibility transfer and provide production contract support.
- (U) Continue support of M-60 tanks refurbishment contract.
- (U) Evaluate and test common chassis for Armored Response Multi-Role Vehicle (ARMRV).

(U) FY 1993 Planned Program:
- (U) Provide CALS production contract mission support.
- (U) Continue testing and award modification contract on common chassis for ARMRV.

Program Element: #0604617F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability

(U) Work Performed By: Program contractors are Sumaria Systems Inc., Wakefield MA for SBCS; Multi-Electric Inc, Chicago IL for CALS; Saco Defense Inc., Saco ME for MARV/SMUD; and Alpine Industries, Ogden UT for the M-60 Oracle blade. The in-house development organizations responsible for elements of the program are Electronic Systems Division, Hancsom AFB MA; Aeronautical Systems Division, Wright-Patterson AFB OH; and Aeronautical Systems Division, Eglin AFB FL.

(U) Related Activities:
- (U) This project transitions advanced development efforts in:
- (U) Program Element #0603307F, Air Base Operability Advanced Development
- (U) Procurement is executed through:
- (U) Program Element #0102896F, Base Operations, Defensive.
- (U) Program Element #0207595F, Base Communications, Tactical Air Forces.
- (U) Program Element #0207596F, Base Operations, Tactical Air Forces.
- (U) Program Element #0401896F, Base Operations.
- (U) Program Element #0702896F, Base Operations (Logistics).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in thousands):
- (U) Other Procurement: (BA 4)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
CALS	0	0	6,000	4,800	6,100	16,900

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3141, Camouflage, Concealment, And Deception (CCD): This project embraces the full spectrum of camouflage, concealment, and deception methods to mitigate the effectiveness of enemy attacks against air bases.

(U) FY 1990 Accomplishments:
- (U) Completed IOT&E on lightweight camouflage nets (LCN) and false operating surfaces (FOS).
- (U) Exercised and supported production option for LCN and FOS.
- (U) Production contract support planned until FY94.

(U) FY 1991 Planned Program:
- (U) Support PMRT for LCN and FOS.

(U) FY 1992 Planned Program:
- (U) Mission Support for CCD.

(U) FY 1993 Planned Program:
- (U) Mission Support for CCD.

Program Element: #0604617F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability

(U) Work Performed By: Program contractor is Ball Corp, San Diego, CA for CCD Systems. The in-house development organization responsible for the program is Aeronautical Systems Division, Wright-Patterson AFB, OH and Aeronautical Systems Division, Eglin AFB, FL.

(U) Related Activities:
- (U) Program Element #0208028F, Camouflage, Concealment, and Deception.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in thousands):
- (U) Other Procurement: (BA 4)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
CCD Kits	7,800	0	0	0	Cont	TBD

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 4057, Survivable Air Base Utility Systems (SABUS): This project will provide Rapid Utility Repair Kits (RURK) kits designed specifically for each of seven utility types: Petroleum, Oils, and Lubricants (POL); electrical-interior; electrical-exterior; water; heating; air conditioning and ventilation; and sewage and drainage.

(U) FY 1990 Accomplishments: Not Applicable.

(U) FY 1991 Planned Program: (PE 64708)
- (U) Begin development of Petroleum, Oils, and Lubricants (POL) kits.

(U) FY 1992 Planned Program:
- (U) Continue development of POL kits.
- (U) Begin development of water kits.
- (U) Begin development of new generation of backup, air transportable generators.

(U) FY 1993 Planned Program:
- (U) Continue development of water kits.
- (U) Complete development of POL kits and begin Pre-Planned Product Improvement.
- (U) Continue development of new generation of backup, air transportable generators.

(U) Work Performed By: Program contractor BDM Corporation, Panama City FL. The in-house development organizations responsible for the program are the Air Force Engineering and Services Center, Tyndall AFB FL; Aeronautical Systems Division, Eglin AFB FL; and the Air Force Weapons Laboratory, Kirtland, AFB NM.

Program Element: #0604617F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability

(U) Related Activities:
- (U) This project transitions advance development efforts in:
- (U) Program Element #0602206F, Civil Engineering & Environmental QA
- (U) Program Element #0603307F, Air Base Operability Advanced Development
- (U) Program Element #0603723F, Civil/Environmental Engr Tech
- (U) Procurement is executed through:
- (U) Program Element #0207596F, Base Operations, Tactical Air Forces.
- (U) Program Element #0401896F, Base Operations.
- (U) Program Element #0702896F, Base Operations (Logistics).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Program Element #0602206F, Civil Engineering and Environmental QA.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in thousands):
- (U) Other Procurement: (BA 4)

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
SABUS Kits	0	0	0	5,300	Cont	TBD

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 4058, Advanced Fire Fighting: This project will design, test and evaluate vehicle hardening kits for fire/crash/rescue (FCR) vehicles. The kits will increase vehicle survivability during post-attack firefighting operations.

(U) FY 1990 Accomplishments: Not Applicable.

(U) FY 1991 Planned Program: Not Applicable.

(U) FY 1992 Planned Program: Not Applicable.

(U) FY 1993 Planned Program:
- (U) Begin development of vehicle hardening kits.

(U) Work Performed By: Program contractor is to be determined. The in-house development organizations responsible for the program are the Air Force Engineering and Services Center, Tyndall AFB FL; Aeronautical Systems Division, Eglin AFB FL; and the Air Force Weapons Laboratory, Kirtland, AFB NM.

Program Element: #0604617F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability

(U) Related Activities:

- (U) This project transitions advanced development efforts in:
- (U) Program Element #0602206F, Civil Engineering & Environmental QA
- (U) Program Element #0603307F, Air Base Operability Advanced Development
- (U) Program Element #0603723F, Civil/Environmental Engr Tech
- (U) Procurement is executed through:
- (U) Program Element #0207596F, Base Operations, Tactical Air Forces.
- (U) Program Element #0401896F, Base Operations.
- (U) Program Element #0702896F, Base Operations (Logistics).
- (U) There is no unnecessary duplication of effort within the Air Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604703F Budget Activity: #4 - Tactical Programs
PE Title: Aeromedical/Chemical Defense Systems

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2866 Aeromedical/Chemical Defense Systems	5,517	5,975	6,797	7,335	Cont	TBD
Total	5,517	5,975	6,797	7,335	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Air Force has limited capability to treat and evacuate wartime casualties from a chemical or conventional warfare environment. This program will develop field medical equipment and systems for this purpose to fulfill Air Force unique needs. This program will also provide tactical and strategic aeromedical evacuation systems for which the Air Force is the lead DOD agency.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

(U) Project 2866, Aeromedical/Chemical Defense Systems: This project consists of the following activities: 1) Civil Reserve Air Fleet Aeromedical Evacuation Shipsets (CRAF AESS) which is developing kits to convert Boeing 767 (phase I) and McDonnell Douglas 80 (phase II) passenger aircraft into aeromedical evacuation (AE) platforms. It will increase strategic AE capability 50 to 100% and free up military aircraft to transport warfighting materiel. 2) Transportable Blood Transshipment Center (TBTC) which will be able to receive, store, rechill, and ship both liquid and frozen blood products to enhance the DoD blood distribution system. 3) The Chemically Hardened Air Transportable Hospital (CHATH) will provide the capability to operate worldwide in chemical threat environments. 4) The Transportable Airborne Therapeutic Station (TATS) which consists of two storage substations which will replace and upgrade the existing system for transporting medical supplies and records for C-141 and C-17 aeromedical missions.

(U) FY 1990 Accomplishments:
- (U) Demo of CRAF AESS onboard Boeing 767, Feb 90.
- (U) Completed TATS DT&E in Nov 89 and OT&E Jun 90.
- (U) Developed and tested, in-house, ground support equipment in the form of a Multiple Service Unit (MSU) which allows civilian liquid oxygen suppliers to service the CRAF AESS as well as shortening the required fill time.

(U) FY 1991 Planned Program:
- (U) CRAF AESS
  - (U) Conducted phase II (MD-80) critical design review.
  - (U) Complete phase I (B-767) DT&E by Mar 91.

Program Element: #0604703F Budget Activity: #4 - Tactical Programs
PE Title: Aeromedical/Chemical Defense Systems

- - (U) Produce and deliver 10 B-767 shipsets by Apr 91.
- - (U) Complete phase I (B-767) OT&E by Apr 91.
- - (U) Complete phase II (MD-80) DT&E by Aug 91.
- - (U) Produce in-house, 22 MSUs.
- - (U) Production of 85 B-767 shipsets.
- (U) TBTC
- - (U) Release full scale development proposal, Oct 90.
- - (U) Award TBTC full scale development contract, Mar 91.
- (U) Produce and deliver 6 CHATHs accelerated.

(U) FY 1992 Planned Program:
- (U) CRAF AESS
- - (U) Complete phase II (MD-80) OT&E by Nov 91.
- - (U) Delivery of 85 B-767 shipsets.
- - (U) Production of 30 MD-80 shipsets.
- (U) TATS production and delivery of 38 units.
- (U) Conduct TBTC critical design review, Nov 91.
- (U) Participate with the Army to complete CHATH system tests.
- (U) Initiate full scale production for 15 CHATHs.

(U) FY 1993 Planned Program:
- (U) CRAF AESS delivery of 30 MD-80 shipsets.
- (U) TBTC
- - (U) Conduct Functional Configuration Audit, 3rd QTR.
- - (U) Conduct Physical Configuration Audit, 3rd QTR.
- - (U) Make production decision, 4th QTR.
- (U) Deliver remaining CHATH units.

(U) Work Performed By: Project is managed by the Aeromedical Systems Division, Human Systems Program Office, Human Systems Division, Brooks AFB, Texas. The contractors are E-Systems, Greenville, TX; Krug Intl, Dayton, OH; and Battelle Memorial Institute, Columbus, OH. In-house developing organizations for the CRAF AESS MSU is SA-ALC/SFRM, Kelly AFB, TX and for CHATH is the Army Natick Research Development and Engineering Center, Natick, MA.

(U) Related Activities:
- (U) Program Element #0602202F, Human Systems Technology.
- (U) Program Element #0604601F, Chemical Defense Equipment.
- (U) Program Element #0603231F, Crew Systems and Personnel Protection Technology.
- (U) Program Element #0603804A, Combat Support Equipment.
- (U) The Army is DOD lead for Chemical Warfare Defense; this project works Air Force unique requirements.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604704F Budget Activity: #4 - Tactical Programs
PE Title: Common Support Equipment

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2479 Common Support Equipment Development	854	1,022	1,437	1,490	Cont	TBD
3759 Air Force Office of Support Equipment Management (AFOSEM)	323	400	463	500	Cont	TBD
3852 60,000 Pound Capacity Aircraft Transporter Loader	5,694	7,071	10,775	4,398	Cont	TBD
Total	6,871	8,493	12,675	6,388	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This full scale development (FSD) program fields more efficient, multi-functional aircraft ground Support Equipment (SE) with increased capabilities to meet the operational needs of Tactical, Strategic and Special Operations Forces. Special emphasis is placed upon developing smaller, more fuel efficient, and lighter SE to reduce airlift requirements and enhance SE transparency during combat. It also implements the AFOSEM objective to develop and promote the use of standardized SE and improve interoperability of the military services by automating and continually updating MIL-HDBK-300 for SE acquisition management needs. This program also develops software for planning tools such as the Support Equipment Acquisition Management System (SEAMS) and automation of SE data bases to support planning, budgeting, and development activities. Beginning in FY 1990 this program also funds development of a special purpose (non-off the shelf) vehicle which is necessary to fill a unique Air Force requirement for a 60,000 pound capacity aircraft cargo loader.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2479, Common Support Equipment Development: This project develops and tests aircraft SE to fill a continuing need for more combat effectiveness, lower life cycle costs, and greater returns on investment. The Advanced X-Ray System (AXES) will be a rugged, high resolution x-ray system which integrates new technology for use on aircraft, engines, and missiles. The Ground Power Generator System (GPGS), originally funded under PE 0604708F, will be fielded.

(U) FY 1990 Accomplishments:
- (U) Released a Request For Information for the AXES.
- (U) Released the Request For Proposals and conducted source selection for the AXES.
- (U) Awarded the AXES contract.
- (U) Conducted Preliminary Design Reviews for the AXES.
- (U) Held Provisioning Conference for the GPGS.
- (U) Completed 30% & 70% Technical Order Reviews for GPGS.
- (U) Conducted Program Management Review for the GPGS.
- (U) Conducted Functional Configuration Audits for the GPGS.

Program Element: #0604704F Budget Activity: #4 - Tactical Programs
PE Title: Common Support Equipment

- (U) Completed Reliability Verification Test for the GPGS.
- (U) Conducted First Article Test for the GPGS.
- (U) Conducted Type I & M Demonstration Training for the GPGS.
- (U) Conducted the Production Readiness Review for the GPGS.
- (U) Awarded Option 1 of the GPGS Production Contract.

(U) FY 1991 Planned Program:
- (U) Conduct Design Reviews for AXES.
- (U) Field/Deliver the Ground Power Generator System (GPGS).
- (U) Conduct Program Management Reviews, Integrated Logistics Support Meetings, Physical Configuration Audits, Technical Data Validations/Verifications for the GPGS.
- (U) Award Option 2 of the GPGS Production Contract.
- (U) Complete Cost Estimate for the Multi-functional Aircraft Support System (MASS) Mission Need Statement (MNS).

(U) FY 1992 Planned Program:
- (U) Conduct Operational Test & Evaluation on AXES.
- (U) Conduct Functional Configuration Audit on AXES.
- (U) Exercise Production Option on AXES.
- (U) Deliver GPGS under Option 1 of the Production Contract.
- (U) Award Option 3 of the GPGS Production Contract.
- (U) Transfer GPGS Program Management Responsibility.

(U) FY 1993 Planned Program:
- (U) Begin Production and Deliveries of AXES.

(U) Work Performed By: The top contractors are Teledyne Continental Motors, Mobile, AL; Modern Technologies Corporation, Dayton, OH; and ITW/Magnaflux, Chicago, IL. The in-house developing organization is the Air Force Systems Command, Aeronautical Systems Division, Wright-Patterson Air Force Base OH.

(U) Related Activities:
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Procurement Funding: 3010 Appropriations/Budget Program 1200/Common Support Equipment.

(U) Procurement (BSA/WSC):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Advanced X-Ray System (AXES)						
Cost	0	0	4,957	5,096	5,110	15,163
Qty.	0	0	143	144	132	419
Ground Power Generator System (GPGS)						
Cost	71,569	83,630	94,583	95,533	0	394,171
Qty.	242	249	325	325	0	1,245

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0604704F Budget Activity: #4 - Tactical Programs
PE Title: Common Support Equipment

2. (U) Project 3759, Air Force Office of Support Equipment Management: This project develops the tools and training required to reduce proliferation of support equipment (SE), increase SE standardization throughout DoD, and improve weapon system interoperability. The Support Equipment Acquisition Management System (SEAMS) now provides for a SE Manager on-line search of inventory DoD SE for new/modified weapon system by required SE characteristics. Resident on the database are the official MIL-HDBK-300, STAM & STAM2 lists, AF TTL/PIL, and MATE & MMHE modules; comprising about 10,000 items of SE.

(U) FY 1990 Accomplishments:
- (U) Developed on SEAMS an automated Munitions Material Handling Equipment (MMHE) module.
- (U) Updated the SE Acquisition Model.
- (U) Developed the Automated SE Extraction Data System (ASEEDS).

(U) FY 1991 Planned Program:
- (U) Use ASEEDS to expand the SEAMS database to include numerous additional items of SE in the Defense Logistic Service Center (DLSC) Total Item Record (TIR).
- (U) Document through Enterprise Analysis the tools and training needed for the SE acquisition community.
- (U) Develop a full Functional Description, Logical Database Model and System Architecture for SEAMS.

(U) FY 1992 Planned Program:
- (U) Develop highest priority tools and training and SEAMS enhancements identified by Enterprise Analysis.
- (U) Maintain and enhance SEAMS database.
- (U) Develop the AFOSEM SE standardization advocacy process.

(U) FY 1993 Planned program:
- (U) Maintain and enhance SEAMS database.
- (U) Develop additional tools and training and SEAMS enhancements identified by Enterprise Analysis.

(U) Work Performed By: The top contractors are Southwest Research Institute, San Antonio, TX; Atlantic Research Corporation Fairborn, OH; and Modern Technologies Corporation, Dayton, OH. In-house organization is the Air Force Logistics Command, Acquisition Logistics Division, Wright Patterson AFB, OH.

(U) Related Activities:
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604704F
PE Title: Common Support Equipment
Project Number: 3852
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
60K Loader	5,694	7,071	10,775	4,398	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project develops a 60,000 pound capacity aircraft transporter/loader to fulfill the requirements of Military Airlift Command (MAC) System Operational Requirements Document (SORD) 002-89-1. The program provides the capability for a single loader to off-load C-5, C-141, C-130, C-17, C-23, C-27, C-160, KC-10, and Civil Reserve Fleet aircraft. The 60,000 pound loader will provide the combined capabilities of the 40,000 pound loader, wide-body elevator loader, and lower lobe loader. The 60K loader will be able to be driven on/off of the C-141, C-5, and C-17 aircraft without shoring. The system will be significantly more reliable than earlier loaders because it will incorporate commercial state-of-the-art components.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Awarded Dual Source Development Contracts.
   - (U) Completed the Logistics Support Analysis Plan (LSAP).

2. (U) FY 1991 Planned Program:
   - (U) Conduct Trade-Off Studies/analysis.
   - (U) Conduct Reliability and Maintainability Assurance Program.
   - (U) Conduct System Layouts/Sub-System Conceptual Design.
   - (U) Conduct the Detailed Engineering Design.
   - (U) Conduct Preliminary/Critical Design Reviews (P/CDR).
   - (U) Initiate Procurement of two Prototypes from each Contractor.
   - (U) Conduct Logistics Support Analysis (LSA)

3. (U) FY 1992 Planned Program:
   - (U) Complete Fabrication of Prototype Loaders.
   - (U) Start Preliminary Vehicle Testing at the contractors facility.
   - (U) Conduct Physical Configuration Audit (PCA).
   - (U) Plan for Initial Operational Test & Evaluation (IOT&E).
   - (U) Plan for Developmental Test & Evaluation (DT&E).
   - (U) Continue work on the Integrated Logistics Support Plan (ILSP).

4. (U) FY 1993 Planned Program:
   - (U) Complete the combined DT&E and IOT&E.
   - (U) Continue/Complete the ILSP.
   - (U) Conduct Production Readiness Reviews (PRR).
   - (U) Complete Provisioning documentation.

Program Element: #0604704F
PE Title: Common Support Equipment
Project Number: 3852
Budget Activity: #4 - Tactical Programs

5. (U) Program to Completion:
   - (U) Incorporate IOT&E Design Changes into the Loader.
   - (U) Testing of IOT&E Changes.
   - (U) Continue Program Support and Engineering Technical Assistance.

D. (U) Work Performed By: The top contractors are Southwest Mobile Systems, St Louis, MO; Teledyne Brown Engineering, Huntsville, AL; and Modern Technologies Corporation, Dayton, OH. The in-house developing organization is the Air Force Logistics Command (AFLC), Warner Robins Air Logistics Center (WR-ALC), Robins Air Force Base, GA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Due to a Congressional reduction of $6.5M in FY91 funding the Reliability Qualification Testing on sub-assemblies has been deleted from the program. Additionally, plans are underway to combine the Developmental Test & Evaluation (DT&E) and the Initial Operational Test & Evaluation (IOT&E).
2. (U) SCHEDULE CHANGES: The start of material purchases and the fabrication & assembly effort have been delayed four months due to the Congressional reduction of FY91 funds. Two additional months for Preliminary Vehicle Testing are necessary to mitigate the added risk caused by the deletion of the Reliability Qualification Testing. The overall program completion schedule will increase up to four months from the baseline.
3. (U) COST CHANGES: The FY91 Appropriations Bill reduced the program by $6.549M. The production contract award is scheduled for FY94. FY93 procurement funds were reprogrammed and production/procurement will continue beyond the SYDP.

F. (U) PROGRAM DOCUMENTATION:
   - (U) HQ MAC Statement of Operational Need, 002-89, February 1989.
   - (U) HQ MAC Systems Operational Requirements Document, 002-89-1, May 89.

G. (U) Related Activities:
   - (U) Inter-service integration is assured through the Military Airlift Command, Airlift Concepts and Requirements Agency, Scott AFB, IL.
   - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) Other Appropriation Funds:

(U) Procurement (BSA/WSC):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
60K Loader						
Cost	0	0	0	0	Cont	TBD
Qty.	0	0	0	0	Cont	TBD

I. (U) International Cooperative Agreements: Not Applicable.

Program Element: #0604704F
PE Title: Common Support Equipment
Project Number: 3852
Budget Activity: #4 - Tactical Programs

J. (U) MILESTONE SCHEDULE:

1.	(U) Award Prototype Contracts	June 1990
2.	(U) Preliminary Design Review (PDR)	December 1990
3.	(U) Critical Design Review (CDR)	September 1991
4.	(U) Start combined Developmental Test & Evaluation and Initial Operational Test & Evaluation	March 1993
5.	(U) Award Production Contract	April 1994
6.	(U) Delivery of First Article	June 1995

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604706F Budget Activity: #4 - Tactical Programs
PE Title: Life Support Systems

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
412A Life Support Systems	3,866	4,474	5,549	8,647	Cont	TBD
3111 Aircraft Mishap Prevention Program	401	2,169	4,207	3,954	750	11,481
3812 COMBAT EDGE	5,045	4,839	2,497	678	0	21,840
Total	9,312	11,482	12,253	13,279	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is the only Air Force program element devoted to full scale development (FSD) of life support equipment. Project 412A is the core project providing centralized management of life support items and subsystems necessary to assure functional capability of aircrews throughout all mission environments and to enhance survival and recovery in emergency situations. It also provides for FSD of emergency equipment and protective clothing and devices for non-flying personnel. Project 3111 develops a management information system to reduce loss of aircrew lives and aircraft due to human factors. Project 3812 accelerates development and fielding of a pressure breathing for G system for F-15 and F-16 crew members to help reduce G-induced loss of consciousness incidents in these aircraft.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 412A, Life Support Systems. Provides for FSD of life support equipment and subsystems to satisfy operational command requirements for improved life support equipment to maximize aircrew capability throughout all environments and to enhance survivability in emergency situations.

(U) FY 1990 Accomplishments:
- (U) Continued Advanced Concept Ejection Seat (ACES) II Restraint Emergency Release (RER) system testing for B-1 and fielded ACES-II RER for F-15, F-16 and A-10.
- (U) Continued fielding LPU-9/P life preserver.
- (U) Began ACES II Advanced Recovery Sequencer (ARS) sled testing.
- (U) Released request for information for universal water activated release system (UWARS) and night vision system (NVS).
- (U) Continued HGU-53/P helmet efforts.

(U) FY 1991 Planned Program:
- (U) Complete ACES II ARS sled testing.

Program Element: #0604706F Budget Activity: #4 - Tactical Programs
PE Title: Life Support Systems

- (U) Award FSD contract for Active Noise Reduction (ANR) and UWARS.
- (U) Continue fielding LPU-9/P and HGU-53/P.
- (U) Award contract for hot weather boot.

(U) FY 1992 Planned Program:
- (U) Begin Water Activated Mask Release System (WAMRS) Initial Operational Test and Evaluation (IOT&E).
- (U) Conduct IOT&E of ANR and Thermal Flash Protective Device (TFPD) systems.
- (U) Continue UWARS FSD.
- (U) Award NVS contract.
- (U) Begin ANR IOT&E.
- (U) Field WAMRS.
- (U) Award contract for Passenger Smoke and Fume Protective System.

(U) FY 1993 Planned Program:
- (U) Begin UWARS DT&E/IOT&E.
- (U) Continue NVS FSD.
- (U) Conduct passenger smoke and fume DT&E/IOT&E.

(U) Work Performed By: Air Force Systems Command's Human Systems Division (HSD), Brooks AFB, TX, manages the Life Support Systems, Project 412A. Support is also provided by other service organizations. The major contractors involved in this project include: Douglas Aircraft Company, Long Beach, CA; Boeing Aircraft Company, Seattle, WA; Gentex Corp. Carbondale, PA (East) and Pomona, CA (West); Conax Florida Corp., St Petersburg, FL; H. Koch & Sons, Anaheim, CA; Weber Aircraft, Titusville, FL; and S-Tron Corp., Redwood City, CA.

(U) Related Activities:
- (U) PE #0602201F, Aerospace Flight Dynamics.
- (U) PE #0602202F, Aerospace Biotechnology.
- (U) PE #0603211F, Aerospace Structures/Materials.
- (U) PE #0603231F, Crew Systems Technology.
- (U) PE #0602723A, Clothing, Equipment and Shelter Technology.
- (U) PE #0604204A, Air Mobility Support Equipment.
- (U) PE #0602241F, Ejection Seat Bio-Dynamics.
- (U) PE #0602758N, Biomedical Technology.
- (U) PE #0603216N, Mission Oriented Clothing and Devices.
- (U) PE #0604264N, Aviation Personnel Life Support System.
- (U) PE #0603216N, Aircrew System Technology.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: ($ in Thousands)

- (U) Approp 3080, OPAF/Other Base Maintenance and Support, BA 4, Items Less Than $2.0M (Safety and Rescue Equipment), P-1 Line Item 186, Automatic Life Preserver (LPU-9/P), $3.025M, 3,040 units.

Program Element: #0604706F Budget Activity: #4 - Tactical Programs
PE Title: Life Support Systems

- (U) Procurement (BA 4):

	FY 1990 Actual	FY 1991 Estimate	FY1992 Estimate	FY1993 Estimate	To Complete	Total Program
Cost	1,900	1,125	0	0	Cont	TBD

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3111, Aircraft Mishap Prevention Program: This project develops a management information system oriented to the analysis of aircraft mishaps. The results will assist the Air Force in the reduction of aircraft mishaps and the loss of human life. This project develops a central operational system within the Air Force Inspection and Safety Center (AFISC).

(U) FY 1990 Accomplishments:
- (U) Completed systems requirements analysis in Jan.
- (U) Released purchase request package in Jul.
- (U) Released request for proposal in Sep.

(U) FY 1991 Planned Program:
- (U) Source selection Oct-Mar.
- (U) Contract award in Mar.
- (U) System design review in Jul.

(U) FY 1992 Planned Program:
- (U) Preliminary design review (PDR) in Feb.
- (U) Complete detailed design.
- (U) Critical design review in Sep.

(U) FY 1993 Planned Program:
- (U) Perform DT&E Oct-Mar.
- (U) AFISC move from Norton AFB to Kirtland AFB - Sep-Mar.
- (U) Perform OT&E - May-Sep.

(U) Work Performed By: HSD, Brooks AFB, TX manages project 3111. Contract award will be to a small, disadvantaged business.

(U) Related Activities:
- (U) PE #0603231F, Crew Systems Technology.
- (U) PE #0602241F, Ejection Seat Bio-Dynamics.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: ($ in Thousands)

- (U) Operations and Maintenance Approp 3400, PE 91212F.

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	0	0	200	804	Cont	TBD

Program Element: #0604706F Budget Activity: #4 - Tactical Programs
PE Title: Life Support Systems

(U) International Cooperative Agreements: Not Applicable.

(U) Project 3812, COMBAT EDGE: This project accelerates development and fielding of a pressure breathing for G (PPG) system for F-15 and F-16 crew members. It will use the G-protection aspects that have been under development in the Tactical Life Support System (TLSS). These include the lower body anti-G suit garment, an upper torso anti-G garment, a lightweight helmet modified with a tensioning bladder, a new oxygen mask, and a modification to the existing oxygen regulator.

(U) FY 1990 Accomplishments:
- (U) Began laboratory and flight DT&E.
- (U) Began support equipment development.

(U) FY 1991 Planned Program:
- (U) Complete DT&E.
- (U) Conduct IOT&E.
- (U) Transition to full scale production.
- (U) Continue manside equipment production and F-16 modification.
- (U) Continue support equipment development.
- (U) Begin HGU-53/P helmet integration.

(U) FY 1992 Planned Program:
- (U) Incorporate design changes resulting from flight testing.
- (U) Continue manside equipment production and F-16 modification.
- (U) Begin production of F-15 modification kits.

(U) FY 1993 Planned Program:
- (U) Continue manside equipment production and F-16/F-15 modification.

(U) Work Performed By: HSD, Brooks AFB, TX manages project 3812. Boeing Aircraft Company, Seattle, WA is the prime contractor with Gentex Corp. (East), Carbondale, PA and Gentex Corp. (West), Pomona, CA, the main subcontractor.

(U) Related Activities:
- (U) PE #0602201F, Aerospace Flight Dynamics.
- (U) PE #0602202F, Aerospace Biotechnology.
- (U) PE #0603211F, Aerospace Structures/Materials.
- (U) PE #0603231F, Crew Systems Technology.
- (U) PE #0602241F, Ejection Seat Bio-Dynamics.
- (U) PE #0602758N, Biomedical Technology.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: ($ in Thousands)

- (U) Aircraft Procurement Modification, Approp 3010, PE 27133F, F-16 Squadrons, BA 5, BP 11, P-1 Line Item F-16.

Program Element: #0604706F Budget Activity: #4 - Tactical Programs
PE Title: Life Support Systems

- (U) Operations and Maintenance Approp 3400, PE 27133F, F-16 Squadrons.
- (U) Aircraft Procurement Modification, Approp 3010, PE 27130F, F-15 Squadrons, BA 5, BP 11, P-1 Line Item F-15.
- (U) Operations and Maintenance Approp 3400, PE 27130F, F-15 Squadrons.

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost	0	19,463	16,685	11,338	Cont	TBD

(U) International Cooperative Agreements: COMBAT EDGE will be releasable to F-16 European Participating Group (EPG) and Foreign Military Sales (FMS) countries. General Dynamics is currently working with EPG/FMS countries to determine requirements for both production incorporation and retrofit of existing aircraft.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604707F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: Weather Systems (Eng Development)

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Complete	To Complete	Total Program
0001 Weather Systems (Engineering Development)	4,503	4,666	5,299	7,699	Cont	TBD
Total	4,503	4,666	5,299	7,699	Cont	TBD

Note: This funding line previously reduced by Dec 88 OSD program budget decision leaving current rampup. Will return to pre-FY90 level of effort in FY94.

B. (U) BRIEF DESCRIPTION OF ELEMENT: Provides engineering development of weather systems to eliminate critical shortfalls in weather support to AF & Army operations. Includes: (a) Automated Weather Distribution System (AWDS): Automates weather data handling at Air Weather Service (AWS) stations on major AF bases, some Army sites, and AF tactical facilities. AWDS pre-planned product improvement (P3I) will enhance interoperability between AWDS, to theater command & control (C2) systems, and with other weather processing facilities. Also upgrades several software functions and develops capability to ingest meteorological satellite & radar data, (b) Battlefield Weather Observation/Forecast System(BWOFS): 2 separate, complementary parts: Pre-Strike Surveillance/Recon System(PRESSURS) to obtain data & Electro-Optical Tactical Decision Aids (EOTDA) to apply data. (c) Solar Electro-Optical Network (SEON) Upgrade: new start develops upgraded capabilities to detect & forecast solar activity impacting DOD systems. (d) Tactical Weather Observation/Forecast System (TWOS/TFS): new start develops capability to tailor weather data to specific battlefield scenarios.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

(U) Project 0001, Weather Systems (Engineering Development): Develops equipment & techniques for badly needed upgrades in AWS support.

(U) FY 1990 Accomplishments:
- (U) AWDS: Down-selected to one production contractor. Completed P3I definition. Developed P3I cost study statement of work. Developed coordinated P3I prototyping testbed plan.
- (U) BWOFS: Completed integration of EOTDA onto PACAF & USAFE C2 systems. Completed all PRESSURS unmanned air vehicle (UAV) weather sensor package documents for FSD. Extended Geophysics Laboratory (GL) concept validation phase contract for miniaturization/flight testing of weather sensors. Initiated technical alternatives cost study for the Tactical Forecast System (TFS) and Tactical Weather Observing System (TWOS).

(U) FY 1991 Planned Program:
- (U) AWDS: Continue P3I enhancement prototyping/development activities.
- (U) BWOFS: Complete PRESSURS program summary report and TWOS/TFS cost study. Complete follow-on technical alternatives studies to

identify possible uses of satellites, manned/unmanned aircraft, and ground-based systems to collect battlefield area weather data. Begin integration of Integrated Weather Analysis (IWA) program onto PACAF C2 system.

(U) FY 1992 Planned Program:
- (U) AWDS: Continue P3I enhancement prototyping and development. Begin prototype deployment for testing.
- (U) BWOFS: Begin integration of IWA onto TAC's C2 system. Complete integration and testing of PACAF IWA program.
- (U) TWOS: Develop a processor and tactical communication capability for the tactical ground observing system.
- (U) SEON upgrade: Develop specifications and RFP for competitive contract for FSD to upgrade SEON radio telescopes to incorporate solar flare pinpointing capability.

(U) FY 1993 Planned Program:
- (U) AWDS: Continue P3I enhancement prototyping & development. Continue deployment of prototyped P3I systems for testing. Begin transitioning P3I enhancements to production.
- (U) BWOFS: Complete integration and testing of IWA on TAC's C2 system. Begin integration of IWA onto SAC's C2 system.
- (U) TWOS: Continue developing processor & tactical communication capability. Integrate tactical wind and temperature profilers and lightning detection system with battlefield communication systems and prepare prototypes for FSD.
- (U) SEON Upgrade: Continue to develop radio telescope hardware and software specifications.

(U) Work Performed By: AWDS development and production are managed by Electronic Systems Division, Hanscom AFB, MA. The prime development contractor was the Canadian Commercial Corp, Ottawa, Canada. MacDonald, Dettwiler & Associates, Ltd, Richmond, British Columbia, Canada was the prime subcontractor. The AWDS production contractor is Contel Corp, Westlake Village, CA.

(U) Related Activities:
- (U) Program Element #0603707F, Weather Systems Advanced Devel.
- (U) Program Element #0305111F, Weather Service.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):
(U) Other Procurement, PE 0305111F (BA 83):

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Cost (AWDS)	15,075	14,800	15,800	13,700	0	59,375
Quantities	52	15	52	43	0	162

(U) International Cooperative Agreements: AWDS Full Scale Development (FY 1984-FY 1988) was done through the joint US-Canada Production & Development Sharing Program. Through this, the Canadian government funded half ($14,000,000) of the development contract. See "Work Performed By" paragraph above for details.

FY FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604708F Budget Activity: #4 - Tactical Programs
PE Title: Other Operational Equipment

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2054 Aerospace Facilities Engineering Development	262	258	427	400	Cont.	TBD
2505 Aircraft Fire Fighting, Suppression and Rescue	749	868	837	922	Cont.	TBD
2674 Tactical Shelters	923	736	867	780	Cont.	TBD
3788 Environmental Quality*	262	279	530	530	Cont.	TBD
Total	2196	2141	2661	2632	Cont.	TBD

* Project 3788, Environmental Quality, was created in FY 1988 to allow better management of this critical development area. It is not a new start; all work was previously being done under project 2054, Aerospace Facilities Engineering Development.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program funds the development, testing and evaluation of materials, equipment and procedures in four separate areas: a) Facilities Engineering improves the operational effectiveness, survivability, durability, and longevity of air base pavements, buildings and utilities; the overall objective is to provide an infrastructure that effectively supports the USAF mission, contributes to high sortie rates, is less susceptible to damage from enemy actions or natural disasters, and is more rapidly returned to service if damaged. b) Fire Fighting, Suppression and Rescue develops new concepts and technology applications to increase fire fighting support of combat operations, to improve base recovery after attack capabilities, and to reduce fire risks to personnel and resources. c) Tactical Shelters is the USAF portion of a tri-service effort to develop standardized, low maintenance, survivable shelters and shelter accessories that are easily mobilized and compatible with air, sea and land transport systems. These products will effectively support high-mobility aircraft support, command and control, communications, medical, and data processing units for the tactical and strategic forces. d) Environmental Quality reduces long-term disposal/cleanup costs and helps ensure USAF compliance with Environmental Protection Agency (EPA) regulations through development of means to identify hazardous waste and pollutant sources, reduce output of sources, mitigate the effects of wastes and pollutants, and dispose of wastes when contamination occurs. Special needs of various operational theaters, including those peculiar to the rapid deployment forces are addressed.

Program Element: #0604708F Budget Activity: #4 - Tactical Programs
PE Title: Other Operational Equipment

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 2054, Aerospace Facilities Engineering Development: Develops equipment, materials, and procedures to improve the operational effectiveness of aerospace facilities.

(U) FY 1990 Accomplishments:
- (U) Furthered development of expedient repair kits for battle-damaged POL distribution systems, the first in a series of expedient repair kits for air base utility systems.

(U) FY 1991 Planned Program:
- (U) Continue development of the expedient POL system repair kit.

(U) FY 1992 Planned Program:
- (U) Initiate development of replacement mobile bare base heating and air conditioning systems.

(U) 1993 Planned Program:
- (U) Conclude development of mobile bare base heating and air conditioning systems.

(U) Work Performed By: Work is performed by the in-house developing organization, the Air Force Engineering and Services Center, Tyndall AFB, FL.

(U) Related Activities:
- (U) Program Element #0603723F, Civil and Environmental Engineering Technology.
- (U) Close cooperation is maintained with other services via the Joint Services Civil Engineering Research and Development Coordinating Group.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

2. (U) Project 2505, Fire Fighting, Suppression, and Rescue: Develops improved fire fighting, suppression and rescue equipment, materials, and methods to increase fire protection readiness, mobility, and effectiveness.

(U) FY 1990 Accomplishments:
- (U) Proceeded with development of an improved crash/rescue vehicle.

Program Element: #0604708F Budget Activity: #4 - Tactical Programs
PE Title: Other Operational Equipment

(U) FY 1991 Planned Program:
- (U) Continue development of firefighter situation simulator trainer.
- (U) Complete evaluation of prototype hot pit fire protection system.
- (U) Complete specification for firefighter chemical warfare breathing apparatus.

(U) FY 1992 Planned Program:
- (U) Continue development of firefighter situation simulator trainer.
- (U) Complete specification for improved crash/rescue vehicle.

(U) 1993 Planned Program:
(U) Continue development of firefighter situation simulator trainer.

(U) Work Performed By: Work is performed by the in-house developing organization, the Air Force Engineering and Services Center, Tyndall AFB, FL.

(U) Related Activities:
- (U) Program Element #0603723F, Civil and Environmental Engineering Technology.
- (U) Close cooperation is maintained with other services via the Joint Services Civil Engineering Research and Development Coordinating Group.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

3. (U) Project 2674, Tactical Shelters: Provides for joint service development and acquisition support of tactical shelter systems, to improve and standardize shelter designs throughout DOD.

(U) FY 1990 Accomplishments:
- (U) Continued development and testing of an International Standards Organization (ISO) loading jack system and full-scale development of an ISO adapter pallet.
- (U) Completed development of variable speed environmental control units (ECUs).
- (U) Completed a three-year study of chromate vs non-chromate paints and primers.
- (U) Continued a joint USAF/US Army/USN/USMC reliability/maintainability documentation program for shelters.

Program Element: #0604708F Budget Activity: #4 - Tactical Programs
PE Title: Other Operational Equipment

- (U) Continued finite element analyses of structural components to determine strength requirements.
- (U) Continued efforts to develop new shelter materials and electromagnetic pulse/electromagnetic interference (EMP/EMI) protection.
- (U) Continued contract development of shelters for specific uses, such as for standard tactical military vehicles.
- (U) Began development and acquisition of ISO loading jack systems.
- (U) Initiated development of chemical warfare hardening kits.

(U) FY 1991 Planned Program:
- (U) Continue development of two separate advanced design prototype shelters.
- (U) Conduct evaluation of off-the-shelf jack systems and the adapter pallet.
- (U) Continue reliability/maintainability efforts.
- (U) Continue work on vehicle-specific shelters.
- (U) Continue finite element analyses of structural components to determine strength requirements.
- (U) Assess effectiveness of current equipment performance in the field.
- (U) Publish a plan for shelter evolution/applications.

(U) FY 1992 Planned Program:
- (U) Complete development of advanced design prototype shelters.
- (U) Complete development of the EMP simulator.
- (U) Continue reliability/maintainability data collection.
- (U) Continue new material and manufacturing process development efforts.
- (U) Continue EMP/EMI and chemical warfare hardening development.
- (U) Begin FSD of advanced design shelter.

(U) FY 1993 Planned Program:
- (U) Continue new material development efforts.
- (U) Investigate outyear requirements and plan new shelter technology development.
- (U) Continue EMP/EMI and chem warfare hardening development.
- (U) Continue FSD of advanced design shelter.

(U) Work Performed By: Work is performed by the University of Dayton Research Institute, Dayton, OH. The in-house developing organization is Air Force Systems Command, Electronic Systems Division, Hanscom AFB, MA.

Program Element: #0604708F Budget Activity: #4 - Tactical Programs
PE Title: Other Operational Equipment

(U) Related Activities:
- (U) Close coordination is maintained with other services via the Joint Committee on Tactical Shelters.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

4. (U) Project 3788, Environmental Quality: Develops means to identify hazardous waste and pollutant sources, reduce output of sources, mitigate the effects of wastes and pollutants, and provide cost-effective disposal of waste.

(U) FY 1990 Accomplishments:
- (U) Completed development of systems for VOC control.
- (U) Completed testing of monitoring technique to show complete destruction of hazardous waste by incineration.

(U) FY 1991 Planned Program:
- (U) Begin predictive mesoscale model for rocket launches.
- (U) Begin collecting and integrating aircraft and VOC data for the emissions dispersion modeling system as a tool for conducting environmental assessments.

(U) FY 1992 Planned Program:
- (U) Continued predictive mesoscale model for rocket launches.
- (U) Begin assimilation and integration of JP-4/JP-8 contamination data as a tool for conducting environmental impact assessments.
- (U) Complete collecting and integrating aircraft and VOC data for the emissions dispersion modeling system as a tool for conducting environmental assessments.

(U) FY 1993 Planned Program:
- (U) Begin Movable Grid Model for complex terrain.
- (U) Complete predictive mesoscale model for rocket launches.
- (U) Complete assimilation and integration of JP-4/JP-8 contamination data as a tool for conducting environmental impact assessments.

(U) Work Performed By: Work is performed jointly with the Environmental Protection Agency (EPA); the Department of Energy Oakridge Laboratories, Oakridge, TN; and the Federal Aviation Adminstration (FAA) Office of Environment and Energy, Washington D.C.. The in-house developing organization is the Air Force Engineering and Services Center, Tyndall AFB, FL.

Program Element: #0604708F Budget Activity: #4 - Tactical Programs
PE Title: Other Operational Equipment

(U) Related Activities:
- (U) Program Element #0603723F, Civil and Environmental Engineering Technology.
- (U) Close cooperation is maintained with other services via the Joint Services Civil Engineering Research and Development Coordinating Group.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604711F Budget Activity: #3-Strategic Programs
PE Title: System Survivability (Nuclear Effects)

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2485 S/V Assessment of Ground C3 Systems	300	300	660	750	Cont	Cont
3429 B-1B EMP Test	2,650	0	0	0	0	20,128
3763 S/V Assessment of Aerospace Systems	4,536	4,582	6,085	5,830	Cont	Cont
TOTAL	7,486	4,882	6,745	6,580	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: Develops and demonstrates the engineering capability required for high confidence hardening and hardness verification and maintenance of Air Force and DOD systems which must operate and survive in nuclear and nuclear related (such as advanced technology) environments. To ensure system survivability in these environments, the Air Force needs hardening materials, analytic techniques, and test methods to develop reliable, cost-effective hardening techniques and to verify and assess system hardness. Project 2485 develops ground based C3I systems survivability techniques for nuclear and nuclear related threats. Project 3429 funded the Electromagnetic Pulse (EMP) Design Verification Test of the B-1B. Project 3763 is similar to 2485 but supports aerospace systems. It also establishes EMP standards and specifications for Air Force and DOD programs.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2485, S/V Assessment of Ground C3 Systems: Refine and adapt the advanced technology and engineering hardening capability as well as hardness maintenance/hardness surveillance (HM/HS) techniques required to ensure C^3I systems can survive in nuclear and nuclear related threat environments.

   (U) FY 1990 Accomplishments:
   - (U) Completed RAMSTAT Field Demonstration Program.
     -- (U) Removal of field units in progress.
   - (U) Completed MIL-STD 188-125 Document.
   - (U) Initiated development of shielded door design.

Program Element: #0604711F Budget Activity: #3-Strategic Programs
PE Title: System Survivability (Nuclear Effects)

(U) FY 1991 Planned Program:
- (U) Complete final report on RAMSTAT.
- (U) Complete development of shielded door design.
- (U) Initiate development of high voltage filter.

(U) FY 1992 Planned Program:
- (U) Complete development of high voltage filter.
- (U) Initiate testing of the high voltage filter.
- (U) Complete testing of the shielded door design.
- (U) Initiate development of an Automated Hardness Assurance and Monitoring System for ground based facilities.

(U) FY 1993 Planned Program:
- (U) Complete design verification testing of the high voltage filter.
- (U) Transition shielded door design to the operational user.
- (U) Complete conceptual design of the Automated Hardness Assurance and Monitoring System and start brassboard design.

(U) Work Performed By: Project managed by the Air Force Weapons Laboratory, Kirtland AFB, NM.

(U) Related Activities:
- (U) Program Element #0602601F, Advanced Weapons
- (U) Program Element #0603438F, Space Systems Survivability
- (U) Program Element #0603605F, Advanced Weapons Technology
- (U) Program Element #0604747F, Electromagnetic Radiation Test Facilities.
- (U) Program Element #0701111F, Aircraft and C^3 S/V Maintenance.
- (U) There is no unnecessary duplication of efforts in the Air Force or DOD programs. The Under Secretary of Defense for Acquisition 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.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3429, B-1B EMP Test: Supports the EMP Design Verification Test (DVT) of the B-1B. Objectives of the test: to verify EMP design specifications, design implementation and safety margins; to establish a hardness maintenance/hardness surveillance (HM/HS) baseline for the B-1B maintenance concept; and to provide data to evaluate EMP hardening designs for future aircraft.

(U) FY 1990 Accomplishments:
- (U) Completed Phase III of the B-1B system level EMP test.
- (U) Analyzed test data to support the hardness maintenance baseline for the B-1B fleet.

Program Element: #0604711F Budget Activity: #3-Strategic Programs
PE Title: System Survivability (Nuclear Effects)

(U) FY1991 Planned Program: Not Applicable.

(U) FY1992 Planned Program: Not Applicable.

(U) FY1993 Planned Program: Not Applicable.

(U) Work Performed By: The project was managed by the Aeronautical Systems Division B-1B System Program Office. Primary civilian contractors: North American Aviation Operation, Rockwell International, Los Angeles, CA; Boeing Military Aircraft Company, Seattle, WA; and Aircraft Engine Group, General Electric Corporation, Evandale, OH.

(U) Related Activities:
- (U) Program Element #0604747F, Electromagnetic Radiation Test Facilities.
- (U) Program Element #0701111F, Aircraft and C^3 S/V Maintenance.
- (U) There was no unnecessary duplication of efforts in the Air Force or DOD programs.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3763, S/V Assessment of Aerospace Systems: Supports the refinement and validation of advanced nuclear hardening techniques and HM/HS techniques for aerospace systems. The nuclear and nuclear related survivability/vulnerability (S/V) of selected systems is determined by analysis and testing. The engineering techniques advanced under this project are transferred to Air Force Product Divisions and Operating Commands for application to new aerospace systems under development or existing systems in operation.

(U) FY 1990 Accomplishments:

- (U) Completed Single Point Excitation for Hardness Surveillance (SPEHS) portable tester and transitioned to OC-ALC.
- (U) Completed development of square wave direct drive system.
  -- (U) Provides wider frequency band for testing.
- (U) Coordinated final draft of EMP hardening handbook.
- (U) Completed upset testing and design fault tolerance guidelines for design of upset tolerant equipment.
  -- (U) Bus monitor tested on B-1B aircraft at OC-ALC.
- (U) 2169A coupling analysis conducted and test data obtained on EMPTAC test 5.
- (U) Began integration of HM/HS testers and long-range plan.
- (U) Various system threats evaluated and criteria developed.
- (U) Continue technology application efforts.

Program Element: #0604711F Budget Activity: #3-Strategic Programs
PE Title: System Survivability (Nuclear Effects)

(U) FY 1991 Planned Program:
- (U) Publish EMP hardening handbook as MIL Handbook.
- (U) Initiate work on composite waveforms for direct drive.
- (U) Begin development of improved simulation for 2169A.
- (U) Upgrade analytical models for nuclear and nuclear related effects.
- (U) Continue threat evaluation and criteria development.
- (U) Continue technology application efforts.

(U) FY 1992 Planned Program:
- (U) Complete Composite Wave Form Direct drive hardness verification technology.
- (U) Develop portable remote site simulators, test techniques, and correlation analysis capabilities.
- (U) Continue EMP test technology.
- (U) Obtain smaller test bed vehicles.
- (U) Continue analysis of nuclear related effects.
- (U) Continue threat evaluation and criteria development.
- (U) Continue technology application efforts.

(U) FY 1993 Planned Program:
- (U) Update EMP hardening handbook.
- (U) Continue EMP test technology.
- (U) Continue threat evaluation and criteria development.
- (U) Continue technology application efforts.

(U) Work Performed By: Project managed by the Air Force Weapons Laboratory, Kirtland AFB, NM, Los Alamos National Laboratory (LANL), and AFIT. Primary civilian contractor: United Engineering, Inc, Albuquerque, NM.

(U) Related Activities:
- (U) Program Element #0602601F, Advanced Weapons
- (U) Program Element #0603438F, Space Systems Survivability
- (U) Program Element #0603605F, Advanced Weapons Technology
- (U) Program Element #0604747F, Electromagnetic Radiation Test Facilities.
- (U) Program Element #0701111F, Aircraft and C^3 S/V Maintenance.
- (U) There is no unnecessary duplication of efforts in the Air Force or DOD programs. The Under Secretary of Defense for Acquisition 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, and has established a Defense EMP Standards and Specifications Program that gives the Air Force the responsibility for aircraft standards within DOD.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604733F
PE Title: Surface Defense Suppression
Project Number: 3006
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands):

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
GBU-15 P^3I	3,493	11,058	21,464	8,552	0	189,763

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program develops an Improved Data Link (IDL) for the GBU-15 guided glide bomb. The IDL provides the GBU-15 with an anti-jam data link to ensure total system performance in current and projected dense electronic countermeasure environments. This program also develops Advanced Support Equipment (ASE) to replace current GBU-15 support equipment. The ASE provides increased efficiency, reliability, and mobility. Reliability will be increased sixfold (500 hours mean time between failures versus 80 hours for the old support equipment). The two-man portable modules of the ASE greatly increase mobility compared with the older 875 pound single unit support equipment. This program also develops the AGM-130 air-to-ground missile which is a Pre-Planned Product Improvement (P^3I) of the GBU-15. The AGM-130A has a 2000 pound MK 84 warhead, television (TV) or imaging infrared (IIR) seeker, and a rocket motor for extended range. The extended range of the AGM-130 reduces delivery aircraft attrition by allowing launch from standoff range, outside target point defenses. The AGM-130 will also have the capability to attack targets in day and at night, and in an electronic countermeasures environment. F-111F and F-15E aircraft will employ the AGM-130. The AGM-130 can use the IDL and ASE being developed for the GBU-15. Remaining development efforts are the integration of the IIR seeker with the AGM-130 and certification of the AGM-130 on the F-15E. The BLU-109 hardened target penetrating warhead is planned to be integrated with the AGM-130 (called AGM-130C) in the future, and is funded under PE 0604327F, Hardened Target Munitions.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Continued IDL development and exercised contract option for production special tooling/special test equipment.
   - (U) Started full scale development of the ASE.
   - (U) AGM-130A with TV seeker approved for low rate initial production.
   - (U) Completed analysis of the GBU-15 IIR seeker utility in the AGM-130A mission.
   - (U) Started integration of the IIR seeker with the AGM-130A and certification of the AGM-130A on the F-15E.

Program Element: #0604733F
PE Title: Surface Defense Suppression
Project Number: 3006
Budget Activity: #4 - Tactical Programs

2. (U) FY 1991 Planned Program:
   - (U) Continue Improved Data Link (IDL) development.
   - (U) Continue integration of the AGM-130A with the IIR seeker and F-15E certification.
   - (U) Continue development of the Advanced Support Equipment (ASE).

3. (U) FY 1992 Planned Program:
   - (U) Complete development of the ASE.
   - (U) Complete IDL development.
   - (U) Complete integration of AGM-130A with the IIR seeker and F-15E.

4. (U) FY 1993 Planned Program:
   - (U) Complete F-15E certification for AGM-130A carriage and launch.
   - (U) Complete DT&E/IOT&E of the AGM-130A with the IIR seeker.
   - (U) Complete IDL DT&E/IOT&E and start low rate initial production.
   - (U) Start AGM-130A full rate production.
   - (U) Initiate development of depot ASE and IDL capability.
   - (U) Complete ASE DT&E/IOT&E and start production.

5. (U) Program to Completion: FY 1993 is the last year of RDT&E funding.

D. (U) WORK PERFORMED BY: Program management is provided by the Deputy for Air-to-Surface Weapons at the Aeronautical Systems Division (ASD) Detachment 24, Eglin AFB, FL. Major contractors are Rockwell International (GBU-15 and AGM-130A prime contractor), Duluth, GA; Hughes Aircraft Co. (current GBU-15 data link contractor), Culver City/Canoga Park, CA; and Hughes Georgia Inc., LaGrange, GA (IIR seeker contractor). Harris/Magnavox team, Melbourne, FL, is the contractor for the IDL. The contractor for the ASE program is General Dynamics Electronics, San Diego, CA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Development of AGM-130 horizontal and vertical hardened target attack capability (AGM-130C) was transferred to PE #0604327F, Hardened Target Munitions.
2. (U) SCHEDULE CHANGES: IDL production delayed 18 months. AGM-130A low rate production delayed 6 months.
3. (U) COST CHANGES: FY 1990 was reduced by $5.429M for higher priority programs. FY 1992 and 1993 were increased a total of $14.904M to complete tasks deferred by the FY 1990 program realignment and to initiate ASE and IDL depot test capability.

F. (U) PROGRAM DOCUMENTATION:
   - (U) TAF 301-86, Statement of Operational Need for a Short-Range, Precision-Guided, Standoff Surface Attack Weapon (S), 2 Nov 87.
   - (U) TAF 301-86-I/II/III-A, System Operational Requirements Document for AGM-130 (GBU-15 P^3I) Short Range Precision Standoff Surface Attack Weapon (S), 23 Jun 89.
   - (U) Test and Evaluation Master Plan for the AGM-130A (C), 21 Sep 89.

Program Element: #0604733F
PE TITLE: Surface Defense Suppression
Project Number: 3006
Budget Activity: #4 - Tactical Programs

G. (U) RELATED ACTIVITIES:
- (U) Program Element #0604327F, Hardened Target Munitions.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

1. (U) PROCUREMENT:

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
- (U) Aircraft Procurement PE 0207165F (BA 4, P-1 Line Item 70)						
Cost	0	0	0	19,999	35,340	55,339
IDL Pod Qty	0	0	0	16	84	100
- (U) Other Procurement PE 0207165F (BA 4, P-1 Line Item 19)						
Cost	0	0	0	1,384	18,616	20,000
ASE Qty	0	0	0	0	20	20
- (U) Other Procurement PE 0208030F (BA 4, P-1 Line Item 19)						
Cost	0,930	0	0	5,150	137,340	142,490
IDL Qty	0	0	0	32	2568	2600
- (U) Missile Procurement PE 0207165F (BA 4, P-1 Line Item 10)						
Cost	27,900	38,434	70,017	100,735	1,319,715	1,556,801
AGM-130 Qty	28	48	120	149	3703	4048

2. (U) MILITARY CONSTRUCTION: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

1. (U) AGM-130A FSD Start	Sep 84
2. (U) AGM-130A DT&E/IOT&E Start	Sep 85
3. (U) AGM-130A Critical Design Review Complete	May 86
4. (U) Improved Data Link FSD Start	Nov 86
5. (U) Advanced Support Equipment FSD Start	Nov 89
6. (U) AGM-130A IIIA Decision	May 90
7. (U) Improved Data Link Low Rate Production Award	1st Qtr FY 1993
8. (U) Advanced Support Equipment Procurement	1st Qtr FY 1993
9. (U) Complete AGM-130A/IIR Seeker Integration	3rd Qtr FY 1993
10. (U) Complete AGM-130A/F-15E Certification	3rd Qtr FY 1993
11. (U) AGM-130A IIIB Decision	3rd Qtr FY 1993

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604735F
PE Title: Range Improvement
Budget Activity: #6 - Defense-Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2152 Mission/Engineering Support	4,500	3,155	3,000	3,000	Cont	TBD
2286 Tactical Air Forces Range Equipment	1,500	4,578	7,540	12,991	Cont	TBD
3320 Strategic Air Command Range Equipment	8,100	3,687	8,960	9,380	Cont	TBD
3321 Electronic Combat Test Resources	47,125	50,560	45,178	49,911	Cont	TBD
6510 Flight Test Threat Systems Simulators	23,819*	20,600**	11,790	10,058	Cont	TBD
Total	85,044	82,580	76,468	85,340	Cont	TBD

* Includes $5.806M placed on OSD withhold and never transferred to the Air Force.

** Includes $4.5M for the Congressionally added Range Security program (assigned to this PE during the FY 92-93 budget process). The Air Force will assign a Project Number and Title for this program which will be included in the next RDT&E Descriptive Summary.

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Range Improvement Program (RIP) contributes to the qualitative improvement of our combat forces by developing instrumentation and modifying air defense threat simulator systems to increase the effectiveness of development and operational testing, training, and large scale exercises. It also funds infrastructure programs to support the Chief of Staff-approved "Test Process for Electronic Combat Systems Development."

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2152, Mission/Engineering Support: Provides basic operating support, system software acquisition, electronic combat (EC) test requirements collection, consolidation, review and support and systems engineering support such as studies, assessments, and analyses.

(U) FY 1990 Accomplishments:

- (U) Continued RIP basic operating support, system software acquisition, and systems engineering support.

Program Element: #0604735F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: Range Improvement

- (U) Continued to develop interoperability between the Air Force Measurement and Debriefing Systems (MDS) ranges and Navy Tactical Aircrew Combat Training System (TACTS) ranges.

(U) FY 1991 Planned Program:
- (U) Continue RIP basic operating support, system software acquisition, and systems engineering support.
- (U) Continue to develop interoperability between the Air Force MDS and Navy TACTS Ranges.

(U) FY 1992 Planned Program:
- (U) Continue RIP basic operating support, systems software acquisition, and systems engineering support.
- (U) Continue to develop interoperability between the Air Force MDS and Navy TACTS Ranges.

(U) FY 1993 Planned Program:
- (U) Continue RIP basic operating support, system software acquisition, and systems engineering support.
- (U) Continue to develop interoperability between the Air Force MDS and Navy TACTS Ranges.

(U) Work Performed by: This program is managed by the Aeronautical Systems Division, Eglin, AFB FL. The major contractors are Sverdrup Corporation and VSE Corporation, Fort Walton Beach, FL.

(U) Related Activities: There is no unnecessary duplication of effort in the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): None.

(U) International Cooperative Agreements: None.

2. (U) Project 3320, Strategic Air Command Range Equipment: This project provides the same type of range equipment, instrumentation and training emitter systems for SAC training ranges as does project 2286 for the tactical forces. The primary effort supports the development of a new Strategic Training Route Complex (STRC) for strategic bomber crew training and the development of the emitter system equipment to be used on the STRC to create a more realistic combat environment.

(U) FY 1990 Accomplishments:
- (U) Continued STRC Operational Test & Evaluation (OT&E) and began Advanced Threat Training Emitter System (ATTES) development.
- (U) Continued Air Combat Maneuvering Instrumentation (ACMI) Bomber Airborne Interface System (BAIS) development.
- (U) Note: The FY 90 budget was cut from $11.197M to $8.1M.

Program Element: #0604735F
PE Title: Range Improvement

Budget Activity: #6 - Defense-Wide Mission Support

(U) FY 1991 Planned Program:
- (U) Continue STRC OT&E, ACMI BAIS, and ATTES development.
- (U) Note: The FY 91 budget was cut from $10.240M to $3.687M.

(U) FY 1992 Planned Program:
- (U) Continue STRC OT&E, ACMI BAIS, and ATTES development.
- (U) Note: The apparent ramp in this Descriptive Summary from $3.687M in FY 91 to $8.960M in FY 92 is actually a cut from the original budget request of $10.240M.

(U) FY 1993 Planned Program:
- (U) Continue STRC OT&E, ACMI BAIS, and ATTES development.

(U) Work Performed by: This program is managed by the Aeronautical Systems Division, Eglin AFB, FL. Major contractors include American Electronics Laboratories, Lansdale, PA, (BAIS), and Georgia Institute of Technology, Atlanta, GA.

(U) Related Activities:
- (U) Navy and Army also engage in threat simulator development.
- (U) All USAF requirements for threat simulators and all developments proposed for inclusion in this project are submitted for review by the CROSSBOW-5 Committee reporting to the DoD Executive Committee on Threat Simulators (EXCOM).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) Test and Evaluation (T&E) investments for some new tri-Service common threat simulators are funded in PE 0604904D, Threat Instrumentation Development.

(U) Other Appropriation Funds ($ In Thousands):
- (U) Procurement OPAF/Electronics & Telecommunications Equipment, P-1 Line Item 129.

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Aircraft Procurement (PE 0101897F/BP19):						
Funds	0	111	4,161	4,978	Continuing	TBD
Quantity	N/A	N/A	N/A	N/A	N/A	
Other Procurement (PE 0101897F):						
Funds	40,553	25,008	18,765	16,302	Continuing	TBD
Quantity	N/A	N/A	N/A	N/A	N/A	

(U) International Cooperative Agreements: None.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604735F
PE Title: Range Improvement
Project Number: 2286
Budget Activity: #6 - Defense-Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Title: Tactical Air Forces Range Equipment

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
(N/A)	1,500	4,578	7,540	12,991	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Provides for the development of electronic, telecommunications, and instrumentation equipment/systems for the tactical operational test and training ranges worldwide. The primary developmental efforts include Air Combat Maneuverability Instrumentation (ACMI)/Measurement and Debriefing Systems (MDS). The United States Air Forces Europe (USAFE) MDS, a new program, represents the major R&D and procurement effort for the TAF. Also provides for the development of an aircraft data transmission interface between the ACMI pods and fighter aircraft; and development of smokewinder pods which provide visual cues to aircrews firing simulated missiles during training.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Continued to develop aircraft interface with ACMI pods, ACMI/Measurement and Debriefing System (MDS) software upgrades, and smokewinder pods.

2. (U) FY 1991 Planned Program:
   - (U) Continue to develop aircraft interface with ACMI pods, and ACMI/MDS software upgrades.
   - (U) Begin ACMI software upgrades for joint Air Force/Army training at National Training Center (NTC)
   - (U) Begin development of a Tactical Air Forces (TAF) MDS, which now represents the major R&D and procurement effort for the TAF Range Improvement Program.

3. (U) FY 1992 Planned Program:
   - (U) Continue to develop aircraft interface with ACMI pods.
   - (U) Continue ACMI software upgrades for joint Air Force/Army training at NTC.
   - (U) Continue development of TAF MDS.

4. (U) FY 1993 Planned Program:
   - (U) Continue to develop aircraft interface with ACMI pods and ACMI/MDS software upgrades.
   - (U) Continue development and upgrade of TAF MDS.

Program Element: #0604735F
PE Title: Range Improvement
Project Number: 2286
Budget Activity: #6 - Defense-Wide Mission Support

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

D. (U) WORK PERFORMED BY: This program is managed by the Aeronautical Systems Division, Eglin AFB, FL. Major contractors include Cubic Corporation, San Diego, CA, (Air Combat Maneuvering Instrumentation System); and Georgia Institute of Technology, Atlanta, GA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) Technical changes: None

2. (U) Schedule changes: The FY 90 budget was cut from $10.372 to $1.5M. As a result, the following programs were not funded: software development for weapons simulation, Red Forces Command and Control R&D, advanced threat simulator development, and software development for the Pil Sung Aircrew Debriefing System (ADS). The FY 91 budget was cut from $12.455M to $5.478M. As a result the following programs were not funded: United States Air Forces Europe (USAFE) Measurement and Debriefing System (MDS) and the Mt Home ADS. Based on reprioritization of programs by the Tactical Air Forces, developmental efforts were begun in FY 91 on two programs associated with the Unmanned Threat Emitter (UMTE) program (UMTE pointing, and Automated Electromagnetic Analysis System (AECMAS). However, due to budget cuts, both programs were cancelled in January 1991. Also, developmental efforts were begun on the Congressionally directed NTC integration effort which caused other programs to be cancelled or reduced in scope.

3. (U) Cost changes: Due to budget cuts, in FY 90 the aircraft interface program was reduced by $1.5M. In FY 91 the aircraft interface program was reduced by $1.9M. The NTC integration program was reduced by $255K.

F. (U) PROGRAM DOCUMENTATION:
- (U) TAF SON 313-80, Improved Aircraft Interface, Unclassified, validated 28 Jun 82.
- (U) TAF SON 304-80, Tactical Self-Protection EW System (U), Secret, validated 15 Jan 81.
- (U) TAF ROC 305-76 (Revised), Improvements to TAF Ranges, Unclassified, 6 Dec 76, validated 18 Jan 77.
- (U) TAF SON 304-81, Airborne ECM Simulation (U), Secret, 4 Apr 81, validated 24 May 82.
- (U) Memorandum of Understanding for the Joint Use and Interoperability between USN TACTS and USAF MDS Training ranges, Unclassified, 21 Sep 88.
- (U) Memorandum of Agreement for the Joint Development and

Program Element: #0604735F
PE Title: Range Improvement

Project Number: 2286
Budget Activity: #6 - Defense-Wide Mission Support

Acquisition of Compatible Navy/Air Force Aircrew Combat Training Systems, Unclassified, 24 Aug 88.

G. (U) RELATED ACTIVITIES:
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
- (U) T&E investments for some new tri-Service common threat simulators are funded in PE 0604904D, Threat Instrumentation Development.

H. (U) OTHER APPROPRIATION FUNDS ($ In Thousands):
- (U) Procurement OPAF/Electronics & Telecommunications Equipment, P-1 Line Item 129.

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Aircraft Procurement (PE 0207429F):						
Cost	4,505	7,830	7,825	6,624	Continuing	TBD
Other Procurement (PE 0207429F):						
Cost	65,603	15,788	21,570	34,774	Continuing	TBD

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE:
(U) NTC Integration IOC: FY 93

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604735F
PE Title: Range Improvement
Project Number: 3321
Budget Activity: #6 - Defense-Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Title: Electronic Combat Test Resources

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
(N/A)	47,125	50,560	45,178	49,911	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
This project develops and acquires the institutional capabilities necessary to support Electronic Combat (EC) test and evaluation (T&E) requirements. Included are digital simulations, hybrid simulators, installed performance T&E facilities, and development of range systems used for T&E of EC systems. The SA-12 Digital Simulation Project (DSP) is an Air Force lead, Tri-Service project to develop and demonstrate a DoD-wide common digital simulation architecture using selected digital modules of the SA-12 system. Hybrid simulations funded by this project are the Air Force Electronic Warfare Evaluation Simulator (AFEWES) and the Real-Time Electromagnetic Digitally Controlled Analyzer and Processor (REDCAP). AFEWES provides closed-loop hybrid simulations of the lethal threat environment. REDCAP simulates the non-lethal portion. This project also funds the Electronic Counter-Counter Measure (ECCM) upgrades of three Eglin AFB facilities: the Pre-Flight Integration of Munitions and Electronic Systems (PRIMES) Facility; the Guided Weapons Evaluation Facility (GWEF); and the Electromagnetic Threat Environment (EMTE). Rome Laboratory's institutional funding necessary to keep their precision antennas ranges operating and updated is provided by this project. Also funded is the Edwards AFB Electronic Integrated Test (ECIT) upgrades needed for as-installed aircraft T&E requirements. Finally, this project provides institutional funding for upgrades and operation of the Radar Test Facility (RTF). The RTF is a facility for both T&E of fielded and in-development ECCM capabilities of airborne radar and EC systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) SA-12 DSP. Started Air Force lead, Tri-Service project.
   - (U) AFEWES upgrade. Completed TWS-8 and GSPR. Continued other Phase II contract projects.
   - (U) REDCAP upgrade. Completed Phase I contract. Awarded Phase II contract. Completed REDCAP-to-ACETEF link demo.
   - (U) ECCM. Continued PRIMES, GWEF, and EMTE upgrade projects.
   - (U) Rome Lab. Continued upgrades based on user requirements.
   - (U) RTF. Completed Phase I APG-70 test bench contract. Awarded Phase II contract.

Program Element: #0604735F
PE Title: Range Improvement
Project Number: 3321
Budget Activity: #6 - Defense-Wide Mission Support

2. (U) FY 1991 Planned Program:
   - (U) SA-12 DSP. Continue Phase I contract.
   - (U) AFEWES upgrades. Complete GPSR, REDFOX and TDS projects. Continue other Phase II contract projects.
   - (U) REDCAP upgrades. Continue Phase II contract upgrades.
   - (U) ECIT. Upgrade Benefield Anechoic Facility (BAF).
   - (U) ECCM. Continue PRIMES, GWEF, and EMTE upgrades. Field Common Test Tool Set at PRIMES.
   - (U) Rome Lab. Continue upgrades based on user requirements. Start instrumentation upgrade project.
   - (U) RTF. Complete Phase II contract procurement. Start integration contract.

3. (U) FY 1992 Planned Program:
   - (U) SA-12 DSP. Complete Phase I. Obtain Phase II approval from OSD/DDDR&E(T&E) and Air Force.
   - (U) AFEWES upgrade. Complete MEG, TWS-10, and IRLE projects. Continue work on other Phase II contract projects.
   - (U) REDCAP upgrade. Continue other Phase II contract upgrades.
   - (U) ECIT. Continue BAF upgrades to meet user requirements.
   - (U) ECCM. Continue PRIMES and EMTE ECCM upgrades. GWEF initial MMV capability.
   - (U) Rome Lab. Continue upgrades based on user requirements. Start computer upgrade project.
   - (U) RTF. APG-70 test bench IOC. Start AMRAAM test bench project.

4. (U) FY 1993 Planned Program:
   - (U) SA-12 DSP. Complete Phase II. Complete project.
   - (U) AFEWES upgrade. Complete RAI project. Continue other Phase II contract for FY94 completion.
   - (U) REDCAP upgrade. Continue Phase II contract for FY94 completion.
   - (U) ECIT. Continue BAF and other Edwards facility upgrades to meet as-installed aircraft requirements.
   - (U) ECCM. Continue PRIMES, GWEF, and EMTE upgrade projects. Field two instrumentation upgrades at EMTE.
   - (U) Rome Lab. Complete instrumentation and computer upgrade projects. Start four antenna pattern measure upgrades.
   - (U) RTF. Continue AMRAAM test bench project.

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

D. (U) WORK PERFORMED BY: Portions of this project are managed by ASD, Wright-Patterson AFB, OH; 6510 Test Wing, Edwards AFB, CA; 3246 Test Wing, Eglin AFB, FL; Rome Laboratory, Griffiss AFB, NY; and the 4484 Test Squadron, Tyndall AFB, FL. Major contractors include General Dynamics Corporation, Fort Worth, TX; Calspan Corporation, Buffalo, NY; and Hughes Aircraft Corporation, Los Angles, CA; Georgia Tech Research Institute, Atlanta, GA, and Rome Research Corp., Rome, NY.

Program Element: #0604735F
PE Title: Range Improvement
Project Number: 3321
Budget Activity: #6 - Defense-Wide Mission Support

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: Electronic Combat Digital Evaluation System (ECDES) and Red Mission Analysis program transferred to OSD's Central T&E Investment Program (CTEIP). Air Force lead, Tri-Service SA-12 DSP initiated with OSD concurrence. Changes made to better align OSD and Air Force EC T&E infrastructure programs. Fiscal constraints forced ECIT technical de-scope of and management transfer from ASD, Eglin AFB to a project managed by the 6510 Test Wing, Edwards AFB, CA.

2. (U) Schedule Changes: Numerous Congressional, OSD, and Air Force fact-of-life budget cuts slipped all the AFEWES and REDCAP upgrades by two years in aggregate. Air Force budget cuts delayed RTF APG-70 test bench IOC.

3. (U) Cost Changes: $60M added across the SYDP to complete the ECIT starting with the upgrades to the BAF. Starting in FY 92, funding for the BAF O&M transferred to PE0604755F, the PE used historically to fund all other Edwards AFB O&M requirements.

F. (U) PROGRAM DOCUMENTATION:
(U) SAC SON 3-79, 20 Jun 80
(U) TAF ROC 305-76, 18 Jan 77
(U) SAC SON 08-81, 28 Jul 82
(U) AFSC SON 004-89, 6 Dec 89

G. (U) RELATED ACTIVITIES:
(U) Navy and Army also engage in electronic combat T&E infrastructure development programs.
(U) All USAF threat simulator programs, including portions of this project are submitted for review by the CROSSBOW-S Committee and the DoD Executive Committee on Threat Simulators (EXCOM).
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
(U) OSD CTEIP program funds T&E programs of high interest to OSD. CTEIP partially funds SA-12 DSP, AFEWES, REDCAP and ECCM.

H. (U) OTHER APPROPRIATION FUNDS ($ In Thousands): Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE:
4Q91: RTF APG-70 Test Bench Procurement contract award.
2Q92: RTF APG-70 Test Bench IOC. GWEF initial MMV capability.
3Q93: SA-12 DSP Phase II complete.
4Q94: AFEWES Phase II upgrade contract complete.
4Q94: REDCAP Phase II upgrade contract complete.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604735F
PE Title: Range Improvement
Project Number: 6510
Budget Activity: #6 - Defense-Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Title: Flight Test Threat Systems Simulators

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
(N/A)	23,819	15,458*	11,790*	10,058*	Cont	TBD

* Includes funds for advanced threat simulators that were transferred to a classified PE in FY91.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project funds simulator modifications necessary to maintain existing threat simulators of the Warsaw Pact to the current intelligence baseline, including the acquisition of advanced signal sources. This project fills a continuing and expanding need to flight test and evaluate new, and newly modified, electronic combat (EC) equipment prior to production. To be effective, this testing must be conducted in an environment which accurately simulates the EC environment to include enemy threat radar simulators. In the past, the adaptability of airborne electronic countermeasure (ECM) systems was quite limited; however, new radar warning receiver signal processing technology and techniques and smart jamming systems are highly adaptive and allow ECM system flexibility. It is extremely difficult to construct a creditable test for such ECM equipment without a large number of different instrumented threat systems to cover the entire threat spectrum.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Continued development on the HAVE PEWTER and HAVE COPPER simulators.
   - (U) Continued simulator modifications.

2. (U) FY 1991 Planned Program:
   - (U) Continue to modify existing simulators to incorporate latest intelligence information; and acquire advanced signal sources.

3. (U) FY 1992 Planned Program:
   - (U) Continue to modify existing simulators to incorporate latest intelligence information; and acquire advanced signal sources.

4. (U) FY 1993 Planned Program:
   - (U) Continue to modify existing simulators to incorporate

Program Element: #0604735F
PE Title: Range Improvement
Project Number: 6510
Budget Activity: 6 - Defense-Wide Mission Support

latest intelligence information; and acquire advanced signal sources.

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

D. (U) WORK PERFORMED BY: This program is managed by the 3246th Test Wing, Eglin AFB, FL. Major contractor is Georgia Institute of Technology, Atlanta, GA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:
1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Funding for HAVE IRON was withdrawn by the Air Force Board Structure. Reinstatement is pending. HAVE PEWTER schedule was modified because the contractor did not build system to meet design specifications. The 2S6 was canceled by the user.
3. (U) COST CHANGES: HAVE PEWTER costs were increased by $9.6M due to performance problems of the delivered Target Tracking Radar. HAVE COPPER costs were increased by $4.5M because original funding was insufficient to meet requirements of the system.

Note: The HAVE COPPER, HAVE PEWTER, and SADS-17 programs were transferred to a classified PE in FY 91.

F. (U) PROGRAM DOCUMENTATION:
- (U) SAC SON 3-79, 20 Jun 80
- (U) TAF ROC 305-76, 18 Jan 77
- (U) SAC SON 08-81, 28 Jul 82

G. (U) RELATED ACTIVITIES:
(U) Navy and Army also engage in threat simulator development.
(U) All USAF requirements for threat simulators, and all developments proposed for inclusion in this project, submitted for review by the CROSSBOW-S Committee reporting to the DoD Executive Committee on Threat Simulators (EXCOM).
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.
(U) T&E investments for some new tri-Service common threat simulators are funded in PE 0604904D, Threat Instrumentation Development.

H. (U) OTHER APPROPRIATION FUNDS ($ In Thousands): Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE:
(U) There are numerous simulators being modified. Two of the most important are the SADS IV and SADS VIII upgrades.
(U) SADS VIII Phase III IOC: 3Q FY 92
(U) SADS IV Phase I IOC: 1Q FY 93

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604740F Budget Activity: #4-Tactical Programs
PE Title: Computer Resources Management Technology

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2239 Computer Security Technology	2,000	1,401	2,105	1,937	Cont	TBD
2522 Requirements Analysis	1,361	989	1,445	1,268	Cont	TBD
2523 Management Control Technology	748	1,524	766	700	Cont	TBD
2524 Policy and Procedure Guidance	475	310	507	468	Cont	TBD
2526 Software Engineering Tools & Methods	1,200	3,171	1,514	1,476	Cont	TBD
2983 Logistics Information Management Support System (LIMSS)	4,931	4,702	*	*	*	*
3315 Computer Aided Acquisition and Logistics Support (CALS)	3,391	1,864	2,082	3,218	Cont	TBD
Total	14,106	13,961	8,419	9,067	Cont	TBD

* Transferred to PE 0708012F in FY 1992.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is an engineering development program that addresses problems of acquiring mission critical computer resources (MCCR) embedded in Air Force systems. This PE is a primary vehicle for transferring the products of advanced development efforts in computer technology into system applications. The objectives are to identify, develop and transfer into operational use tools, techniques and computer technology advances that support the following: (1) Providing secure, reliable, adaptable, maintainable, and survivable systems; (2) Reducing software life cycle costs; (3) Providing timely development and support of MCCR products; (4) Enhancing AF personnel ability to acquire and support systems by providing guidance on policy, procedures, and training; and (5) Providing a totally integrated capability to create, accept, retrieve and store digital (paperless) technical information for life cycle support for Air Force logistics.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 2239, Computer Security Technology: Develop and apply computer security (COMPUSEC) products to support Air Force/DOD operations, and disseminate information on COMPUSEC issues and

Program Element: 0604740F Budget Activity: #4-Tactical Programs
PE Title: Computer Resource Management Technology

solutions. This project achieves its objectives by focusing on the demonstration and transition of security proven systems and mechanisms. Direction is taken from security policies and regulations such as National Security Decision Directive 145, Office of Management and Budget Circular A-130 and DOD Directive 5200.8.

(U) FY 1990 Accomplishments:
- (U) Continued Security Products (Security Pro) Program task - awarded contract for general purpose Multilevel Security (MLS) products.
- (U) Began development of the System Lifecycle Risk Expert (SLRX) tool. SLRX is an artificial intelligence software aid that is used to determine security risks throughout the lifecycle of a weapon system.
- (U) Established the Security Products Transition Analysis Facility (STAF). The STAF contains hardware, software and personnel dedicated to investigating emerging computer security technology and transitioning it to field use.
- (U) Established the STAF as a test site for biometric authentication equipment under development by the National Security Agency (NSA).

(U) FY 1991 Planned Program:
- (U) Continue Security Pro Program task.
- (U) Complete development of the SLRX tool and begin transition.
- (U) Transition a Compartmented Mode Workstation to HQ SAC.
- (U) Continue computer security commercial-off-the-shelf hardware and software functionality and interoperability testing to transition technologies to operational sites.

(U) FY 1992 Planned Program:
- (U) Continue Security Pro task.
- (U) Initiate an Ada software verification system task.
- (U) Continue technology transition of SLRX tool.

(U) FY 1993 Planned Program:
- (U) Continue Security Pro task.
- (U) Continue Ada software verification system task.
- (U) Continue testing biometric authentication devices for NSA.

(U) Worked Performed By: Work is performed by the MITRE Corp., Bedford, MA; Gemini Computers Corp., Monterey, CA; and Unisys Corp., Paoli, VA.

(U) Related Activities:
- (U) Program Element #0603728F, Advanced Computer Technology.
- (U) Program Element #0603752F, DOD Software Engineering Institute.
- (U) Program Element #0303401F, Communications Security.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

Program Element: 0604740F Budget Activity: #4-Tactical Programs
PE Title: Computer Resource Management Technology

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: None.

2. (U) Project 2522, Requirements Analysis: Develop and apply tools that provide Air Force program offices with rapid insight into the technical performance, cost, schedule, and high risk implications of stated computer resources system requirements. These tools structure and control changing requirements; explore performance and supportability trade-offs; and examine alternatives prior to making hardware, software, and financial commitments.

(U) FY 1990 Accomplishments:
- (U) Continued development of Display Rapid Prototyping & Simulation (DRPS) system. DRPS is a software development tool used to create prototypes of software displays for use in developing weapon system software requirements.
- (U) Initiated a User Requirements System (URS) development task. The URS will be used to cross reference user requirements and design solutions to ensure no incompatibilities exist.
- (U) Continued development of the SERPENT User Interface Management System.

(U) FY 1991 Planned Program:
- (U) Complete development of DRPS.
- (U) Continue the User Requirements System (URS) task.
- (U) Transition the SERPENT system to software developers.

(U) FY 1992 Planned Program:
- (U) Begin development of the Rapid Prototyping System (RPS) to speed the transition of new software technology into weapon systems.
- (U) Continue to develop a Tool for Tailoring Software Test Requirements.
- (U) Initiate a Standard Generalized Markup Language (SGML) based assistant to aid in analyzing software and system specifications (i.e. Hypertext).

(U) FY 1993 Planned Program:
- (U) Continue development of the Rapid Prototyping System (RPS).
- (U) Initiate a Tool for Tailoring Software Test Requirements task.

(U) Work Performed By: Work is performed by Hughes Aircraft Company, Fullerton, CA.; Software Engineering Institute (SEI), Pittsburgh, PA; and Bernier Associates, Topsfield, MA.

(U) Related Activities:
- (U) Program Element #0603728F, Advanced Computer Technology.
- (U) Program Element #0603752F, DOD Software Engineering Institute.
- (U) Program Element #0603756F, DOD Software Initiative.

Program Element: 0604740F Budget Activity: #4-Tactical Programs
PE Title: Computer Resource Management Technology

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: None.

3. (U) Project 2523, Management Control Technology: Develop and evaluate methods for estimating software development costs and defining acquisition strategies and practices that aid in the control of mission-critical computer resources. Efforts will support the Joint Logistics Commanders (JLC) objectives to eliminate unnecessary duplication and proliferation of software acquisition standards and practices among the three Services.

(U) FY 1990 Accomplishments:
- (U) Continued funding JLC Support Activities.
- (U) Published, through the JLC, DOD-HDBK-267 (implementation of DOD-STD-2167A) and DOD-HDBK-268 (implementation of DOD-STD-2168).
- (U) Revised MIL-STD-1521 and completed MIL-HDBK-347.
- (U) Established Technology Forecast task at the Software Engineering Institute.
- (U) Began Technology Transition Process Improvement (T2PI).

(U) FY 1991 Planned Program:
- (U) Initiate a Corporate MCCR Technical Management System (TMS) task to improve MCCR contract management.
- (U) Continue funding JLC Support Activities.
- (U) Transition an Acquisition Managers Quality Specification Tool (AMQST) developed by RADC under PE 63728F.
- (U) Initiate technology transition of Software Lifecycle Support Environment (SLCSE).

(U) FY 1992 Planned Program:
- (U) Continue TMS task.
- (U) Continue T2PI development.
- (U) Initiate an Avionics Reliability Design Tool task.
- (U) Initiate a Joint STARS IV&V testing/tracking tool task.

(U) FY 1993 Planned Program:
- (U) Continue TMS task.
- (U) Continue SLCSE technology transition and support.
- (U) Implement T2PI and continue Technology Forecast task.
- (U) Continue development of Joint Stars IV&V tool.

(U) Work Performed By: Work is performed by the Advanced Technology Corp., Reston, VA.

(U) Related Activities:
- (U) Program Element #0603728F, Advanced Computer Technology.
- (U) Program Element #0603752F, DOD Software Engineering.
- (U) Program Element #0604770F, Joint STARS.

- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: None.

4. Project 2524 Policy and Procedures Guidance: Develop comprehensive support guidance and procedures which lead to improvements in the planning, acquisition, and support of mission critical computer resources. Through the use of guidebooks, video tapes, multimedia training methods, and automated management aids, this project will provide training to Air Force personnel in software acquisition management.

(U) FY 1990 Accomplishments:
- (U) Completed Courseware Transportability Initiative (CTI) task.
- (U) Completed Version 2.0 of ACQUIRE CD-ROM task.
- (U) Initiated Common Index Architecture Specification (CIAS) task.

(U) FY 1991 Planned Program:
- (U) Begin update of Software Guidebooks.
- (U) Initiate the Advanced Learning Technologies (ALT) task. ALT will investigate advances in computer based training for use in software development training.
- (U) Begin Constraint Checking for Data Input Stream (CCDIS) task. CCDIS is a software development effort to build a generic command center for TAC that can check incoming messages for consistency.
- (U) Complete CIAS development.

(U) FY 1992 Planned Program:
- (U) Continue the ALT task.
- (U) Complete the update of Software Guidebooks.
- (U) Continue CCDIS task.

(U) FY 1993 Planned Program:
- (U) Complete the ALT and CCDIS tasks.
- (U) Demonstrate advanced optical technologies prototype in an operational environment.

(U) Work Performed By: Work is performed by MEI Associates, Lexington, MA.

(U) Related Activities:
- (U) Program Element #0603728F, Advanced Computer Technology.
- (U) Program Element #0603752F, DOD Software Engineering Institute.
- (U) Program Element #0603756F, DOD Software Initiative.
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

Program Element: 0604740F Budget Activity: #4-Tactical Programs
PE Title: Computer Resource Management Technology

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: None.

5. (U) Project 2526, Software Engineering Tools and Methods: Develop and implement a comprehensive set of integrated tools to improve the software development, acquisition, and support process. In addition, this project will place major emphasis on providing planning and support for the continued implementation of the Ada High Order Language (HOL) into the Air Force and the introduction of Artificial Intelligence to improve engineering approaches. An ongoing responsibility is to conduct Ada technology transition- providing the Ada community with information on Ada related methodologies and technologies.

(U) FY 1990 Accomplishments:
- (U) Completed the Expert Missile Maintenance Aid (EMMA) task.
- (U) Continued the Portable Natural Language Database Interface (PNLDBI) task - developed a test suite and applied the product to the MAC-Plan program.
- (U) Completed the Common Ada Missile Packages (CAMP) Reusability Training (CAMP-3) task.
- (U) Initiated the Software Architecture Engineering (SAE) task.

(U) FY 1991 Planned Program:
- (U) Continue the PNLDBI task- publish a knowledge engineering document.
- (U) Continue development of SAE.
- (U) Initiate Common Software for Command Center Applications (CSCCA) task.
- (U) Transition an Aircrew Scheduler Expert System developed by RADC to operational use in the field.
- (U) Begin the development of Reusable Ada Avionics Software Packages (RAASP).
- (U) Begin the development of a Reusable Software Repository.

(U) FY 1992 Planned Program:
- (U) Continue the PNLDBI task.
- (U) Continue development of SAE and RAASP.
- (U) Initiate a Flexible Customization Methodology task.
- (U) Begin development of Automated Crisis Action Assistant.

(U) FY 1993 Planned Program:
- (U) Complete the PNLDBI task.
- (U) Continue SAE, RAASP, and CSCCA development.
- (U) Initiate development of Speech Recognition System (SRS).

(U) Work Performed By: Work is performed by the MITRE Corp., Bedford, MA; General Electric Company, Schenectady NY; Raytheon Corp., Bedford, MA; and Rockwell International, Anaheim, CA.

(U) Related Activities:
- (U) Program Element #0603728F, Advanced Computer Technology.

Program Element: 0604740F Budget Activity: #4-Tactical Programs
PE Title: Computer Resource Management Technology

- (U) Program Element #0603752F, DOD Software Engineering Institute.
- (U) Program Element #0603756F, DOD Software Initiative.
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: None.

6. (U) Project 2983, Logistics Information Management Support System LIMSS): This is a long term planning effort to provide a standard architecture and a Command, Control, and Communications (C3) infrastructure that will integrate the various logistics information systems. This will improve wartime capability by improving information access, timeliness, and accuracy. The program will provide a broad plan to integrate the various logistics information systems being developed autonomously.

(U) FY 1990 Accomplishments:
- (U) Expanded LIMMS model base and continued work.
- (U) Updated the Logistics C-CS Plan and the Transportation Architecture.
- (U) Released the Logistics Supply Architecture final document.
- (U) Updated the LIMSS data base.
- (U) Released the draft Engineering and Services Architecture.

(U) FY 1991 Planned Program:
- (U) Update the Maintenance Architecture.
- (U) Update the LIMSS data base.
- (U) Release the final Engineering and Services Architecture.

(U) FY 1992 Planned Program:
- (U) None.

(U) FY 1993 Planned Program:
- (U) None.

(U) Program To Completion:
- (U) This program will be transferred to PE #0708012F in FY 1992.

(U) Work Performed By: Work is performed by the Transportation Systems Center (TSC), Cambridge, MA.

(U) Related Activities:
- (U) There is no unnecessary duplication of effort in the Air Force or the Department of Defense.

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: None.

Program Element: 0604740F Budget Activity: #4-Tactical Programs
PE Title: Computer Resource Management Technology

7. (U) Project 3315, Computer Aided Acquisition and Logistics Support (CALS): DOD Defense Guidance and Office of the Secretary of Defense (OSD) funding initiatives have emphasized the need to improve the preparation, delivery, use and updating of digital technical information used in the design, manufacture, maintenance and operation of DOD weapon systems.

(U) FY 1990 Accomplishments:
- (U) Completed the integrated automation of processes across the Technical Order (TO), Logistic Support Information (LSI), and Product Definition Data (PDD) modules.
- (U) Operational feedback was collected and used to modify the integrated automation (CALS Roadmap) plan.
- (U) Completed revision of the PDD automation plan.
- (U) Initiated development of Software Product Data (SPD) Module.

(U) FY 1991 Planned Program:
- (U) An integrated Weapon System Data Base Planning Module will be created to implement a data base containing weapon system product and supportability data.
- (U) Continue definition of SPD requirements and integration planning.

(U) FY 1992 Planned Program:
- (U) Begin development of an Integrated Technical Information System (ITIS).
- (U) Complete SPD automation plan.
- (U) Continue development of TO, LSI, PDD and SPD standards.

(U) FY 1993 Planned Program:
- (U) Begin integration of the Integrated Technical Information System (ITIS) at field activities.
- (U) Continue development of TO, LSI, PDD and SPD standards.

(U) Work Performed By: Work is performed by the Transportation Systems Center, Cambridge, MA; Dynatrend, Cambridge, MA; and Unisys, Cambridge, MA.

(U) Related Activities:
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: None.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604747F
PE Title: Electromagnetic Radiation (EMR) Test Facilities

Budget Activity: #6 - Defense-Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
1209	EMP Simulation Test Facilities					
	3,294	2,787	3,807	4,131	Cont	TBD
2064	HAVE NOTE					
	816	958	961	1,032	Cont	TBD
Total	4,110	3,745	4,768	5,163	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Funds operation, maintenance, and improvement of test facilities used by weapon system program offices to determine ability of systems to operate in nuclear (Project 1209) and non-nuclear (Project 2064) electromagnetic environments. The PE provides institutional funding required for both the Phillips Laboratory Electromagnetic Pulse (EMP) test facilities and the Rome Laboratory non-nuclear electromagnetic environment test facilities. Continued institutional funding is required to insure weapons systems and command, control, communication, and intelligence (C3I) systems can operate in an EMP environment during Emergency War Order contingencies and the non-nuclear electromagnetic radiation (EMR) environment during conventional operations. Users pay for the actual costs of their tests.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

1. (U) 1209, EMP Simulation Test Facilities:
Funds acquisition and support of the Phillips Laboratory test facilities which simulate nuclear electromagnetic pulse (EMP) environments in which weapon systems may be required to operate. The principal EMP simulators used to test aircraft and large missiles are the Vertically and Horizontally Polarized Dipoles (VPD and HPD) and the TRESTLE. The AFWL/Los Alamos Electromagnetic Calibration and Simulation (ALECS) Facility, a smaller simulator, is used to test small missiles and communications equipment. Additional capabilities include portable EMP generators for remote site tests and a laboratory used for testing individual electronic components.

Program Element: #0604747F Budget Activity: #6 - Defense -Wide Mission Support
PE Title: Electromagnetic Radiation (EMR) Test Facilities

(U) FY 1990 Accomplishments:
- (U) Continued tests of the B-1B and the EC-135.
- (U) Began tests of the 4 Electronic Service switching (ESS)systems for the Defense Communications Agency (DCA).
- (U) Began tests of the SRAM II for the Air Force.
- (U) Continue EMP Test Aircraft (EMPTAC) Support.

(U) FY 1991 Planned Program:
- (U) Complete EC-135, and SRAM II, and DSMDPS EMP tests.
- (U) Continue EMPTAC support.
- (U) Start and complete initial SINCGARS EMP TEST.
- (U) Note: The total FY 91 program was cut from the original budget request of $4.788M to $3.745M. Project 1209 cut from $3.83M to $2.787M.

(U) FY 1992 Planned Program:
- (U) Start and complete initial KC-135 Avionic Upgrade EMP test.
- (U) Initiate planned B-1B Hardness Maintenance and Hardness Support (HM/HS) tests.
- (U) Start Rail Garrison Basing Mode EMP test.
- (U) Continue EMPTAC Support.
- (U) Note: The apparent ramp in this Descriptive Summary from FY 91 $3.745M to FY 92 $4.768M is actually a cut from the original FY 91 estimate of $4.788 and FY 92 estimate of $4.806M.

(U) FY 1993 Planned Program:
- (U) Start B-2 System Level EMP testing.
- (U) Continue B-1B HM/HS testing.
- (U) Continue EMPTAC Support.

(U) Work Performed by: The Phillips Laboratory, Kirtland AFB, NM, manages this project. BDM International, Inc., McLean, VA, is the facilities support contractor.

(U) Related Activities:
- (U) Project 2064, HAVE NOTE, is the Air Force implementation of the DoD Special Electromagnetic Interference Project, which directs the services to test air-launched weapons for non-nuclear electromagnetic interference and to share test results and conclusions.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0604747F Budget Activity: #6 - Defense -Wide Mission Support
PE Title: Electromagnetic Radiation (EMR) Test Facilities

2. (U) Project 2064, HAVE NOTE: Develops, acquires, improves and supports the Rome Laboratory test facilities which simulate the worldwide non-nuclear electromagnetic environments in which Air Force weapon systems as well as command, control, communication and intelligence (C3I) systems will operate in. Weapon and C3I systems are evaluated in the facilities to assess their susceptibility to non-nuclear electromagnetic radiation (EMR) from hostile or friendly sources such as communications transmitters, radars, jammer, high power microwave (HPM) directed energy sources, Ultra Wideband (UWB) sources and other electromagnetic sources. Project 2064 facilities illuminate the system with a replica simulation of EMR environments it may encounter during its operational mission. The principal facility is the Electromagnetic Environmental Effects Research Center. It consists of a large anechoic chamber facility for free space electromagnetic environments simulations; a large mode tuned reverberation chamber facility for rapid "quick look" evaluations; a smaller anechoic chamber facility for fuze and subsystem evaluations; and a RF and microwave instrumentation development facility. The electromagnetic susceptibility data is used to perform weapon system and C3I system vulnerability assessments. Susceptibility data is also used to update test methods, acquisition specifications, hardening design guidelines, and maintenance of technical orders to ensure that the weapon systems and C3I system are immune to non-nuclear EMR emanations encountered during their life cycles.

(U) FY 1990 Accomplishments:
- (U) Began Sensor Fuzed Weapon (SFW) HAVE NOTE vulnerability assessments.
- (U) Continued HAVE NOTE support to AMRRAM JSPO, AGM-130 SPO, and GBU-15/ABM-130 Improved Data Link SPO.
- (U) Completed high powered testing of development model of B-1B jammer antenna.
- (U) Completed test methodology development needed to support low level HPM test requirements.
- (U) Continued instrumentation and RF source improvements to the Reverberation Chamber.

(U) FY 1991 Planned Program:
- (U) Complete HAVE NOTE measurements of the three SFW weapon system components.
- (U) Continue HAVE NOTE support to AMRAAM JSPO, AGM-130 SPO, and GBU-15/AGM-130 Improved Data Link SPO.
- (U) Began replacement of twelve year old Data acquisition and Control System (ADACS) computer system.
- (U) Complete Reverbation Chamber FY 1990 improvements. Begin upgrade for increased capability to function as a TEM hybrid facility.

Program Element: #0604747F Budget Activity: #6 - Defense -Wide Mission Support
PE Title: Electromagnetic Radiation (EMR) Test Facilities

(U) FY 1992 Planned Program:
- (U) Begin HAVE NOTE evaluations of AMRAAM Producibility Enhancement Program, AGM-130, and GBU-15/AGM-130 Improved Data Link (IDL) hardware.
- (U) Begin HAVE NOTE planning for AIM-9P/4 and HAVE NAP programs.
- (U) Complete replacement of twelve year old ADACS computer system.

(U) FY 1993 Planned program:
- (U) Complete HAVE NOTE vulnerability assessments of AMRAAM Producibility Enhancement Program, AGM-130, and GBU-15/AGM-130 IDL hardware.
- (U) Begin HAVE NOTE assessment of AIM-9P/4.
- (U) Begin HAVE NOTE assessment of HAVE NAP Program.

(U) Work Performed by: Project 2064 is managed by AFSC's Rome Laboratory, Griffiss Air Force Base, NY. The facility and engineering support contractor is Rome Research Corporation, New Hartford, NY. Rome Laboratory also has contracts with Georgia Tech Research Institute (GTRI), Atlanta, GA; National Institute of Standards and Technology (NIST), Boulder, CO; the University of Colorado, Colorado Springs, CO, for EMR methodology development efforts; Kaman Sciences, Colorado Springs, CO; DIGICOMP, Rome, NY; SAIC, Vienna, VA; BOEING, Seattle, WA; and JAYCOR, Albuquerque, NM.

(U) Related Activities:
- (U) HAVE NOTE assessments also support the OSD Joint Electromagnetic Interference (JEMI) office at Eglin AFB. Project 1209 managed by the Phillips Laboratory supports nuclear EMP test facilities.
- (U) There is no unnecessary duplication of efforts with the Air Force of the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604750F Budget Activity: #4 - Tactical Programs
PE Title: Intelligence Equipment

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
1174 Intelligence Security Equipment	925	982	N/A	N/A	N/A	15,300
2053 Foreign Technology Division Intelligence Processes	2,534	2,894	2,983	3,148	Continuing	N/A
TOTAL	3,459	3,876	2,983	3,148	Continuing	N/A

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Program Element supports USAF operating commands by performing the engineering development of ground equipment and/or techniques to streamline the processing, integration, display and distribution of intelligence data. Developed software will reduce the time required for the exploitation of intelligence data by Air Force agencies producing strategic, tactical, and scientific and technical intelligence products. Equipment and techniques are also developed to counter the foreign intelligence threat to the USAF mission.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 1174, Intelligence Security Equipment: The state-of-the-art in electronics and

This project develops equipment to The Air Force Office of Special Investigations (AFOSI) needs this research and development program to maintain it's counterespionage mission capability and to protect the Air Force investment in advanced technology. This is the only program developing equipment to support the Technical Surveillance Countermeasures (TSCM) mission. AFOSI requested the funding under this project be converted to 3080 funds in FY 92 and beyond under a separate PE. OSI will seek to reestablish an R&D capability with funding provided in the National Foreign Intelligence Program.

(U) FY 1990 Accomplishments:

Program Element: #0604750F Budget Activity: #4 - Tactical Programs
PE Title: Intelligence Equipment

(U) FY 1991 Planned Program:

(U) FY 1992 Planned Program: N/A

(U) FY 1993 Planned Program: N/A

(U) Project to Completion: Efforts in FY 1991 will bring the program to a logical transition point to resume funding under NFIP in FY 1992.

(U) Work Performed By: UNISYS Corporation, Salt Lake City, UT; Southwest Research Institute, San Antonio, TX; Hughes Aircraft, Fullerton CA.

(U) Related Activities:
- (U) Program Element #0305127F, Foreign Counterintelligence.
- (U) Program Element #0305128F, Security and Investigative Activities.
- (U) Coordination with the

prevents duplication of effort.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

2. (U) Project 2053, Foreign Technology Division (FTD) Intelligence Processes: FTD's mission is to acquire, evaluate, analyze and report on foreign scientific and technological progress in response to Department of Defense
The advent of

This project improves the FTD capability to acquire, evaluate, analyze, and report on foreign scientific and technical information and material and to provide timely and accurate threat assessments of foreign weapon system technology. These improvements will assist in responding to intelligence requirements vital to operational commanders, research and development planners, and national level agencies.

Program Element: #0604750F Budget Activity: #4 - Tactical Programs
PE Title: Intelligence Equipment

(U) FY 1990 Accomplishments:

- (U) Delivered new technology modules for the ELINT Tutor System

(U) FY 1991 Planned Program:
- (U) Complete development of a computer program to model

(U) FY 1992 Planned Program:
- (U) Complete Phase III of the Advanced Systematic Analysis Production (ASAP) expert system.
- (U) Initiate development of software programs to model foreign aerodynamic missiles employing low observable technology.

(U) FY 1993 Planned Program:

- (U) Initiate development of Air Combat Simulation and Reconstruction model to analyze the manuverability and combat effectiveness of threat aircraft.
- (U) These are both new starts and cumulatively require the slight increase above inflation.

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

(U) Work Performed By: Martin Marietta, Orlando FL; Rockwell Power Services, Albuquerqe, NM; HRB Systems State College PA

(U) Related Activities: PE 0301310F (FTD).

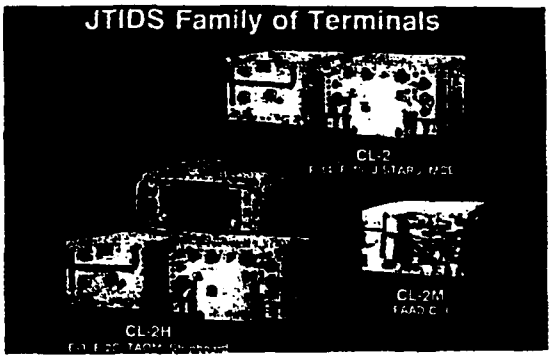
(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604754F
PE Title: Joint Tactical Information Distribution System (JTIDS)
Project Number: P771
Budget Activity: #4-Tactical Programs

Project Title: Joint Tactical Information Distribution System



POPULAR NAME: JTIDS

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands)

SCHEDULE ($000)	FY 1990	FY 1991	FY 1992	FY 1993	To Complete
Major Contract	20,662	22,448	9,466	5,682	20,780
Support Contract	8,120	8,945	3,464	7,271	23,633
In-House Support	1,754	2,140	500	628	9,987
GFE/ Other	1,943	3,904	2,991	3,590	13,091
Total	32,479	37,437	16,421	17,171	67,491
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	(To Complete)
Program Milestones				IIIB CLS 2/ 2H October	
Engineering Milestones			FCA/PCA		
T&E Milestones	Post DAB Phase 1 DT/OT	Conduct F-15 /E-3 Multi Platform Testing	AF/Navy Joint OT&E	Army/AF Joint OT&E	
Contract Milestones	Lot 1 Production	Lot 2 Production	Lot 3 Production	Lot 4 Production	

Program Element: #0604754F Project Number: P771
PE Title: Joint Tactical Information Distribution System (JTIDS) Budget Activity: #4-Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The objective of this program is to provide command and control of air defense resources, pilot situational awareness, avoiding fratricide and dual targeting. It is 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 (TDMA), and spread spectrum techniques. The system will permit rapid and secure exchange of essential command, control, and status information among all terminals in the tactical theater.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Awarded contract for F-15 LRIP terminals.
   - (U) Awarded contract for follow-on development work (software upgrades).
   - (U) Began Reliability Growth Program.
   - (U) Completed F-15 Advanced Mobile Electronic Test Set (AMETS) study.
   - (U) Completed first flight on Joint STARS.
   - (U) Completed Post DAB Phase 1 DT/OT at Eglin AFB.
   - (U) Completed multiservice DT-1, Air Force at Navy VACAPES test ranges.
   - (U) Made depot selection.
   - (U) Transferred Multifunctional Information Distribution System - Low Volume (MIDS-LV) program to the Navy.
   - (U) Awarded contract for Navy Block II FSD terminals.
   - (U) Awarded contract for JTIDS Interface Simulator (JIS).

2. (U) FY 1991 Planned Program:
   - (U) Award contract for common Central Processing Unit (CPU) modification.
   - (U) Continue development of intermediate support equipment and depot level test program sets.
   - (U) Conduct joint service, multi-platform testing.
   - (U) Continue activation of Class 2/2H depot.
   - (U) Continue Class 2 terminal software development.
   - (U) Develop AMETS into the JTIDS AF I-level test set.
   - (U) Continue system integration and software development for MCE.
   - (U) Select a government centralized software support activity (CSSA) for JTIDS.
   - (U) Award contract for Navy production terminals.
   - (U) Award contract for P^3I.
   - (U) Conduct F-15/E-3 development testing.

3. (U) FY 1992 Planned Program:
   - (U) Begin delivery of Class 2 production terminals.
   - (U) Continue development of common software for Joint Service terminals.
   - (U) Begin activation of the JTIDS CSSA.

Program Element: #0604754F Project Number: P771
PE Title: Joint Tactical Information Distribution System (JTIDS) Budget Activity: #4-Tactical Programs

- (U) Conduct joint Air Force/Navy OT&E.
- (U) Obtain expanded spectrum certification.

4. (U) FY 1993 Planned Program:
   - (U) First MCE/E-3/Joint STARS production buy.
   - (U) Initiate usage of limited organic depot capability.
   - (U) Deploy initial AMETS to operating locations.
   - (U) Conduct joint Air Force/Army OT&E.

5. (U) Program to Completion:
   - (U) Complete activation of hardware depot and CSSA.

D. (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 (ECAC), Annapolis, MD. Major contractors are: GEC-Marconi Electronic Systems Corp. (formerly Plessey Electronic Systems Corp. (Class 2 terminal lead developer), Totowa, NJ; Rockwell-Collins (Class 2 terminal follower), Cedar Rapids, IA; International Business Machines (surface terminal facility), Owego, NY; McDonnell Douglas Aircraft Corporation (F-15 integration), St Louis, MO; and MITRE Corporation (system engineering support), Bedford, MA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None

2. (U) SCHEDULE CHANGES: First MCE/E-3/Joint STARS production moved to FY93 due to individual PE reprogrammings.

3. (U) COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION:
   - (U) Tactical Air Forces Statement of Operational Need (TAF SON) 703-73, November 1973
   - (U) JTIDS System Operations Concept (SOC), 15 March 1987
   - (U) Decision Coordinating Paper (DCP), 6 June 1989
   - (U) Joint Integrated Logistics Support Plan, 16 June 1989
   - (U) Multiple Required Operational Capability (MROC) MJCS-194-89, 16 August 1989
   - (U) JTIDS Program Baseline, 11 October 1989
   - (U) Acquisition Decision Memorandum, 11 October 1989
   - (U) System Operational Requirements Document (SORD), TAF-306-74-I/II/III-A, 16 November 1989
   - (U) Test and Evaluation Master Plan (TEMP), 13 Nov 90.

G. (U) RELATED ACTIVITIES:
   - (U) Program Element #27130F F-15
   - (U) Program Element #64770F Joint STARS

Program Element: #0604754F Project Number: P771
PE Title: Joint Tactical Information Distribution System (JTIDS) Budget Activity: #4-Tactical Programs

- (U) Program Element #27417F E-3
- (U) Program Element #27412F MCE
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.
- (U) Joint Pprogram Designator (JPD) to be determined at Milestone IIIB.

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

- (U) Procurement APAF F-15 (BP 1100/1600):

	FY 1990 ACTUAL	FY 1991 ESTIMATE	FY 1992 ESTIMATE	FY 1993 ESTIMATE	To Complete	Total PROGRAM
Cost	41,800	1,400	0	0	Cont.	TBD

- (U) Procurement APAF E-3 (BP 1100/1600):

	FY 1990 ACTUAL	FY 1991 ESTIMATE	FY 1992 ESTIMATE	FY 1993 ESTIMATE	To Complete	Total PROGRAM
Cost	0	0	0	22,200	Cont.	TBD

- (U) Procurement APAF JSTARS (BP 1600):

	FY 1990 ACTUAL	FY 1991 ESTIMATE	FY 1992 ESTIMATE	FY 1993 ESTIMATE	To Complete	Total PROGRAM
Cost	0	0	5,734	28,698	Cont.	TBD

- (U) Procurement OPAF MCES (BP 8300):

	FY 1990 ACTUAL	FY 1991 ESTIMATE	FY 1992 ESTIMATE	FY 1993 ESTIMATE	To Complete	Total PROGRAM
Cost	0	0	0	18,920	Cont.	TBD

- (U) MILITARY CONSTRUCTION: None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: The UK and France have verbally indicated an interest in purchasing JTIDS terminals beginning in FY 91. A Memorandum of Understanding (MOU) between the UK and US Government is in effect and under review by the UK and US Government.

Program Element: #0604754F Project Number: P771
PE Title: Joint Tactical Information Distribution System (JTIDS) Budget Activity: #4-Tactical Programs

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
Pre-DAB DT/OA	1/89 - 5/89	Resolved test issues to support LRIP decision
JSTARS 1st JTIDS flight	1/90	Successful data transfer
TEMP	11/90	OSD & Services approved
Navy DT-IID	7/90 - 9/90	Sucessfully completed NAVY DT&E required for Lot 2 Exit Criteria
Navy OT-IIA	10/90	Final report pending
Post DAB phasr 1 DT/OT	9/90	Sucessfully exchanged position and surveillance data between AF & Navy platforms.

T&E ACTIVITY (TO COMPLETION)

Event	Planned Date	Remarks
Joint AF/Navy OT&E #1	9/91 - 10/91	Multi-service testing required to support Lot 3 Exit Criteria - will involve F-15, E-3, F-14D, E-2C & Navy ships.
Joint AF/Navy OT&E #2	4/92	AF/Navy interoperability in an EW environment - supports M/S IIIB.
Multi-service OT #3	2/93	AF/Army interoperability in an EW environment - supports M/S IIIB.
Joint AF/Army OT&E	4/93	AF/Army interoperability - supports M/S IIIB

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604755F
PE Title: Improved Capability for DT&E
Budget Activity: #6 - Defense-wide Mission Support

A. (U) RESOURCES ($ in thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2880 4950th Test Wing (4950TW)	5,685	820	3,990	3,615	Cont	TBD
3120 Air Force Development Test Center (AFDTC)	13,549	6,004	16,362	19,516	Cont	TBD
3285 Arnold Engineering Development Center (AEDC)	2,545	3,204	8,370	12,188	Cont	TBD
3323 Cruise Missile Mission Control Aircraft (CMMCA)	12,853	9,438	0	0	0	52,576
3324 HAVE LINK	3,547	489	1,331	4,901	Cont	TBD
3620 Air Force Flight Test Center (AFFTC)	16,290	15,257	26,206	23,969	Cont	TBD
Total	54,469	35,212	56,259	64,189	Cont	TBD

NOTE: This is one of the six AF RDT&E Test Infrastructure accounts which provides direct support to the DoD test mission. The aggregate FY 92 budget for these accounts reflects a negative real growth in excess of 21 percent since 1968. As a result, significant technology advancements have occurred during this time period without the investment in the test infrastructure to support the advanced test capability requirements.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program insures the DoD Major Range and Test Facilities Base (MRTFB) test and evaluation technology is compatible with the systems it is required to test. This program provides planning, improvements, and modernization for test capabilities at 4 MRTFBs. These MRTFBs (4950TW, AEDC, AFFTC, and AFDTC) enable testing through all phases of weapon system acquisition from system concepts through component and full scale integrated weapon system testing to support of operational testing. These 4 test centers have over $10 Billion worth of unique test facilities. They are a national asset operated and maintained by the AF for DoD test and evaluation missions, but they are available to others having a requirement for its unique capabilities.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project: 2880, 4950th Test Wing: The 4950th TW, Aeronautical Systems Division, Wright-Patterson AFB, OH, performs flight tests of aircraft and airborne systems, supports space vehicle tracking for the Air Force, other DoD agencies and NASA. Cruise Missile Mission Control Aircraft (CMMCA) which became operational in FY90 supports cruise missile testing. Staging out of US and overseas bases, the Advanced Range Instrumentation Aircraft (ARIA) provides telemetry support for NASA and DoD missile launches. CMMCA support funds development of critical Software Development System (SDS), and Interim Contractor Support (ICS) necessary for initial maintenance of CMMCA aircraft. Integrated Data Facility (IDF) consists of a ground-based laboratory module, a real-time test

data monitoring module and a module for improved data computation and analysis. IDF enables secure data processing and software modifications necessary for conduct of ARIA and CMMCA missions. Scoring Systems aircraft modifications will enable determination of precise impact positions and times of reentry bodies during ballistic missile testing such as Peacekeeper and Trident. Scoring Systems aircraft modification will increase effectiveness and accuracy of DoD missile launches.

(U) FY 1990 Accomplishments:
- (U) Started CMMCA SDS and ICS efforts. ($0.4M)
- (U) IDF program continues with emphasis on providing secure areas for classified projects. IDF Digital Format Converter System became operational. IDF Engineering Workstations and personal computers were integrated with the local area network. IDF fiber-optic connections installed between buildings.($1.2M)
- (U) Scoring Systems Aircraft Modification completed and began testing with first flight test in April 90.($1.6M)
- (U) Completed upgrade of C-135 test bed aircraft. ($2.5M)

(U) FY 1991 Planned Program:
- (U) Continue CMMCA ICS efforts.($0.8M)

(U) FY 1992 Planned Program:
- (U) Complete CMMCA ICS effort.($0.5M)
- (U) IDF program continues with classified processing vault and Phase II of Local Area Network becoming operational. ($3.5M)

(U) FY 1993 Planned Program:
- (U) IDF program continues with IOC of Computational and Analysis Module. ($3.6M)

(U) Work Performed By: Electro-Space Industries, Richardson, TX & ASD in-house Resources.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project: 3323, Cruise Missile Control Aircraft CMMCA: The existing test support scenario for cruise missile testing requires a fleet of up to 11 aircraft to provide visual safety chase, telemetry collection and tanker support. This support scenario is resource intensive and the visual safety chase requirement precludes testing in other than visual meteorological flight conditions. The Cruise Missile Mission Control Aircraft (CMMCA) will consolidate telemetry support, mission control functions, radar safety chase, and flight following capabilities into a single airborne platform. Consequently, CMMCA will replace visual safety chase for most cruise missile test missions resulting in significant savings.

Program Element: #0604755F
PE Title: Improved Capability for DT&E

Budget Activity: #6 - Defense-wide Mission Support

(U) FY 1990 Accomplishments:
- (U) Initiated modification on both EC-18D aircraft.
- (U) Completed structural modifications on aircraft #895.
- (U) Delivered first radar subsystem.
- (U) Delivered first telemetry processor system.

(U) FY 1991 Planned Program:
- (U) First structural flight test (#895) first quarter.
- (U) First system flight test (#893) second quarter.
- (U) Delivery of aircraft #893 (IOC) third quarter.
- (U) Mission equipment installed (#895) second quarter.
- (U) System flight test second aircraft (#895) third quarter.
- (U) Delivery of aircraft #895 (FOC) fourth quarter.

(U) FY 1992 and 1993 Planned Program:
- (U) No funding required. This part of program completed.

(U) Work Performed By: Electrospace Systems, Inc, Richardson, TX and Aeronautical Systems Division, Wright-Patterson Air Force Base, OH.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

3. (U) Project: 3324, HAVE LINK: The Air Force HAVE LINK program implements Office of the Secretary of Defense direction to increase operational security on sensitive unclassified information and test data on test ranges. The HAVE LINK program implements corrective measures to eliminate identified vulnerabilities subject to exploitation by hostile intelligence collection agencies.

(U) FY 1990 Accomplishments:
- (U) 4950th Test Wing: Obtained STU-III telephones for nine buildings, installed West Ramp Perimeter Security System, provided radios and equipment to meet compliance for upgraded base Crash Net, purchased UHF SATCOM Secure Voice equipment for ARIA Secure SATCOM project (one aircraft installation), purchased components for IDF vaults, and acoustically tested Building 4010 secure Room. ($0.7M)
- (U) AFDTC: Converted additional microwave links and began procurement of encrypted airborne video equipment. ($1.3M)
- (U) AEDC: Unclassified Data Communication Network (UDCN) project to procure and install base-wide automated data processing network continued. ($0.5M)
- (U) AFFTC: Procured range telemetry encryption equipment and secure land radios. Performed computer security assessment. ($1.1M)

(U) FY 1991 Planned Program:
- (U) 4950th Test Wing: Complete Building 4010 Secure Room upgrade and develop classified data processing capability. ($0.4M)

Program Element: #0604755F
PE Title: Improved Capability for DT&E

Budget Activity: #6 - Defense-wide Mission Support

(U) FY 1992 Planned Program:
- (U) 4950th Test Wing: Development of classified data processing capability continue and second ARIA Secure SATCOM capability acquisition begins. ($0.1M)
- (U) AEDC: Continue development of UDCN.with installations in 4th satellite building. ($0.4M)
- (U) AFDTC: Additional acquisition of encryption devices for microwave systems.($0.4M)
- (U) AFFTC: Continue network security upgrade, land radio procurement, and range telemetry upgrade.($0.4M)

(U) FY 1993 Planned Program:
- (U) 4950th Test Wing: Development of ARIA Secure SATCOM capability completion and ARIA Intrusion Detection system begins. ($1.1M)
- (U) AEDC: Continue development of UDCN.with installation in 5th satellite building. ($1.0M)
- (U) AFDTC: Begin encryption of video equipment. ($1.4M)
- (U) AFFTC: Complete range telemetry encryption upgrade, and continue network and facility security upgrades. ($1.4M)

(U) Worked Performed By: Digital Equipment Corporation, Pittsburgh, PA; Motorola, Inc., Scottsdale, AZ; Dorne & Margolin, Inc., Bohemia, NY; Andrew Corp., Orland Park, IL; various GSA vendors; and AFFTC, AEDC, and AFDTC in-house resources.

(U) Related Activities:
- (U) Program Element 0605708F Test and Evaluation Support
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

Program Element: #0604755F
PE Title: Improved Capability for DT&E
Project Number: 3120
Budget Activity: #6 - Defense-wide Mission Support

A. (U) RESOURCES ($ in thousands)

Project Title / Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Air Force Development Test Center (AFDTC)	13,549	6,004	16,362	19,516	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The AFDTC, located at Eglin AFB, FL, is responsible for the test and evaluation (T&E) of non-nuclear air armaments, electronic combat systems, climatic simulation, target acquisition and weapon delivery systems and for the determination of target/test item electronic signatures. Preflight Integration of Munitions and Electronic Systems (PRIMES) provides the instrumentation to conduct preflight test and evaluation of total integrated weapon systems in a secure anechoic chamber. The Guided Weapon Evaluation Facility (GWEF) provides a full spectrum, multifunctional seeker/sensor laboratory test capability for all guided weapons. Airborne Test Instrumentation (ATI) incorporates standardized aircraft instrumentation kits and new airborne instrumentation pods. ATI along with Seeker T&E provides ground and airborne test instrumentation support for IR, MMW, and laser weapon RDT&E programs. The Armament Systems Test Environment (ASTE) Range Systems effort upgrades instrumentation of the major data collection systems supporting munitions test requirements. The Electromagnetic Test Environment (EMTE) Range Systems modernizes instrumentation which supports the electronic combat test process. Mission Control/Data Analysis provides for real-time central mission control and analysis. These projects insure test center technology is compatible with weapon systems to be tested such as AMRAAM, MMW MAVERICK, AGM-130, Sensor Fused Weapon, JTIDS, JSTARS, Silent Attack Warning System, etc. The Climatic Test Facility modernization of instrumentation and environmental capabilities supports the major upgrade which will extend its useful life to 2015.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) PRIMES completed the electromagnetic environment simulator. ($1.3M)
   - (U) Procured equipment for MMW simulation giving GWEF initial capability for testing MMW seekers. ($1.0M)
   - (U) Acquisition of a standard suite of test instrumentation began under Airborne Test Instrumentation. ($0.7M)
   - (U) Seeker T&E provided instrumentation of the tower system, IR cameras and airborne pod.instrumentation. ($3.3M)
   - (U) ASTE Range Systems improved data collection systems such as cinetheodolite, photo-optic cameras, high-speed video, explosive instrumentation, warhead and fuse test systems, gun test, telemetry, and microwave. ($3.5M)
   - (U) EMTE Range Systems provide CCTV, timing equipment, and test instrumentation. ($0.4M)
   - (U) Mission Control/Data Analysis acquired a digital communications system providing communication between test control rooms and remote range resources. ($1.8M)
   - (U) The Climatic Test Facility purchased snow machines and began upgrade of air make-up unit to keep facility operating until major refurbishment is completed in FY 94. ($1.5M)

Program Element: #0604755F
PE Title: Improved Capability for DT&E
Project Number: 3120
Budget Activity: #6 - Defense-wide Mission Support

2. (U) FY 1991 Planned Program:
- (U) PRIMES funding will provide for a microwave environment generator and a transportable signal simulator. ($1.2M)
- (U) GWEF will provide a capability for hardware-in-the-loop simulation of MMW guided weapons against tactical targets. A study will be performed defining interface between GWEF and PRIMES. ($1.0M)
- (U) Airborne Test Instrumentation will continue to procure standard aircraft instrumentation kits to support SEEK EAGLE Stores Certification. ($0.4M)
- (U) Seeker T&E will complete the multispectral tower system and a quick-look data support system. Integration of new IR imaging systems will begin. ($1.3M)
- (U) ASTE Range Systems will continue upgrades of high-speed video, range photo-optics, and electro-optical equipment with emphasis on cinetheodolite upgrades. ($0.8M)
- (U) EMTE Range Systems will procure instrumentation upgrades for threat simulators. ($0.1M)
- (U) Mission Control/Data Analysis will procure real-time display systems for mission control consoles. ($0.8M)
- (U) The interim upgrade to the Climatic Test Facility will be completed keeping facility operating until major refurbishment is completed in FY 94. Instrumentation and data equipment upgrade program begins. ($0.3M)

3. (U) FY 1992 Planned Program:
- (U) A communications/data link simulator and supporting instrumentation will be procured for PRIMES. ($1.9M)
- (U) The MMW Simulator System in the GWEF will be completed. Development of an Imaging IR Scene Generator and a threat laser capability will begin. ($1.5M)
- (U) Standardized Aircraft Instrumentation (SAI) kits will be procured along with instrumentation pod development for Airborne Test instrumentation. ($1.7M)
- (U) Seeker T&E will procure a spectrometer/radiometer for target/background signature measurement, hardware/software for the Thermal Imaging Processing System, and begin the MMW 140 GHz radar. ($2.8M)
- (U) EMTE Range Systems will begin procuring the Scanning Transient Pulse Measurement System and continue EMTE instrumentation upgrades. ($2.0M)
- (U) Mission Control/Data Analysis project will provide data analysis equipment to perform real-time operational and post-mission data processing. ($2.1M)
- (U) Upgrades to the Climatic Test Facility continues with the procurement of a fiber-optics system. ($0.6M)
- (U) ASTE Range Systems continues upgrading data collection systems with emphasis on gun ranges, microwave towers, range telemetry and GPS. ($3.8M)

4. (U) FY 1993 Planned Program:
- (U) PRIMES will procure instrumentation and simulation equipment capable of greater bandwidth and higher speed. Procurement of a flight environment simulator will begin. ($2.2M)
- (U) GWEF will complete the IR Scene Generator effort and the threat lasers with required instrumentation. ($1.6M)
- (U) Airborne Test Instrumentation will continue modifying three test aircraft per year with the SAI kits. ($3.4M)

Program Element: #0604755F
PE Title: Improved Capability for DT&E
Project Number: 3120
Budget Activity: #6 - Defense-wide Mission Support

- (U) Seeker T&E will begin modification of the Calibrated Airborne Spatial Measurement System (CASMS) and procurement of weather instrumentation. ($3.5M)
- (U) EMTE Range Systems will complete the Scanning Transient Pulse Measurement System, and continue EMTE instrumentation upgrades. ($2.9M)
- (U) ASTE Range Systems will continue upgrading cinetheodolites, microwave towers, GPS and range telemetry. ($3.2M)
- (U) Mission Control will complete the real-time test support capability and will begin procurement of computers and displays for classified mission areas. ($2.1M)
- (U) Additional telemetry data systems will be acquired for the Climatic Test Facility. ($0.6M)

5. (U) Program to Completion: This is a continuing project.

D. (U) WORKED PERFORMED BY: Cross Systems, Atlanta, GA (GWEF); TRW, Warner Robins, GA (PRIMES); GEC Avionics Ltd, London, England; and Southern Research Technology, Birmingham, AL (Seeker T&E).

E. (U) COMPARISON WITH FY 1991 DESCRIPTIONS SUMMARY:
1. (U) Technical Change: Not Applicable.
2. (U) Schedule Change: Not Applicable.
3. (U) Cost Changes: Due to higher priorities, funding for this program was reduced in FY91 causing some schedule delays. In addition, Congress reduced funding during review of the FY91 budget resulting in further schedule delays and increased FY92 costs. Funding was increased in FY92 and FY93 to affect prior year decreases ensuring critical test capabilities are modernized. Additional $1.0M and $1.5M were added in FY92 and FY93 to modernize EMTE range, slowing its deterioration.

F. (U) PROGRAM DOCUMENTATION: PMD 2164(5)/0604755F Improved Capability for DT&E.

G. (U) RELATED ACTIVITIES:
- (U) PE0604940D, Test Instrumentation Development.
- (U) PE0605807F, Test and Evaluation Support.
- (U) PE0605735F, Range Improvement Program.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATIONS: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE: This is a continuing project.

Program Element: #0604755F Project Number: 3285
PE Title: Improved Capability for DT&E Budget Activity: #6 - Defense-wide Mission Support

A. (U) RESOURCES ($ in thousands):

Project Title / Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Arnold Engineering Development Center(AEDC)	2,545	3,204	8,370	12,188	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
AEDC, Arnold AFB, TN, provides ground environmental test support for DoD aeronautical, missile and space programs. The center has 23 active test cells providing: aerodynamic testing of scale model aircraft, missile and space systems, testing of large and full-scale satellites, sensors and space vehicles in a simulated space environment; altitude environmental testing for aircraft, missile, and spacecraft propulsion systems; and testing of large-scale models such as space boosters together with their propulsion systems. The Large Rocket Test facility (J-6) will enable safe testing of solid propellant rocket motors such as Peacekeeper at simulated altitude conditions. MILCON funding provides the DOD with a J-6 test facility while funds in this project provide for the testing and activation of the actual J-6 facility. T-3 program will enable testing of next generation cruise missile engines through the upgrade of existing capabilities. Improved Ballistic Range program provides critical soft launch ballistic capability, replacing closed DELCO facility, by upgrading existing capabilities. C-Cell Data Acquisition System provides processing capability needed for advanced turbine engine testing on programs like ATF and NASP. The current system is available 80 percent of the time due to frequent breakdown and non-availability of spare parts. This results in lost and ineffective missions increasing program costs and schedule delays. The upgraded system availability will be close to the required 98 percent. Test Unit Support Systems (TUSS) project replaces antiquated control systems which are labor intensive and inefficient. TUSS will automate control systems in jet engine and rocket engine test facilities.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Large Rocket Test Facility (J-6) initiated with planning for test and activation beginning (IOC FY95). ($0.5M)
   - (U) Test Cell T-3 modification design completed and construction/system integration on-going. ($1.8M)
   - (U) Improved Ballistic Range project detail design began with evaluation of several concepts (IOC FY94). ($0.2M)

2. (U) FY 1991 Planned Program:
   - (U) J-6 project continues with test and activation planning on-going (IOC FY95). ($1.4M)
   - (U) Test Cell T-3 modification continues with system construction/system integration on-going. ($0.6M)
   - (U) Improved Ballistic Range project design complete and acquisition starts (IOC FY94). ($1.2M)

3. (U) FY 1992 Planned Program:
   - (U) J-6 project continues with emphasis on technical reviews of facility design/construction (IOC FY95). ($1.4M)
   - (U) C-Cell Data Acquisition System initiated with acquisition and of processors.($2.6M)

Program Element: #0604755F Project Number: 3285
PE Title: Improved Capability for DT&E Budget Activity: #6 - Defense-wide Mission Support

- (U) TUSS project starts with control systems acquisition and installation in wind tunnel. ($1.3M)
- (U) Test Cell T-3 modification becomes operational.
- (U) Improved Ballistic Range project acquisition continues with fabrication of new launches components. ($2.8M)

4. (U) FY1993 Planned Program:
   - (U) J-6 project continues with detailed technical reviews and mission support; begins project activation with beneficial occupancy of two new buildings, and begins planning detailed system integration (IOC FY95). ($6.2M)
   - (U) C-Cell Data Acquisition System continues with installation of processors. ($1.7M)
   - (U) TUSS project continues with control systems acquisition and installation in jet engine test cell. ($0.7M)
   - (U) Improved Ballistic Range project acquisition continues with initial installation of equipment (IOC FY94). ($3.6M)

D. (U) Work Performed By: Calspan Field Services, Inc., Buffalo, NY and AEDC in-house resources

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:
1. (U) Technical Changes: Not Applicable
2. (U) Schedule Changes: J-6 construction contract awarded in November 89. J-6 IOC delayed by one year due to contract award protest and subsequent moratorium on construction starts. Construction restarted August 90.
3. (U) Cost Changes: Congress reduced funding for this program in FY91 causing schedule delays and increased costs. Improved Ballistic Range funding increased in FY92 and FY93 by $2.8M and $3.6M respectively to offset prior year decreases and enable IOC in FY94. J-6 funding decreased in FY92 by $4.6M with increase in FY94 of $4.9M to account for construction delay.

F. (U) PROGRAM DOCUMENTATION: PMD 2164(5)/0604755F Improved Capability for DT&E.

G. (U) RELATED ACTIVITIES:
(U) Program Element 0604940D Test Instrumentation Development.
(U) Program Element 0605807F Test and Evaluation Support
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
MILCON	66.0	30.0	79.3	0	0	225.3

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE: This is a continuing project.

Program Element: #0604755F Project Number: 3620
PE Title: Improved Capability for DT&E Budget Activity: #6 - Defense-wide Mission Support

A. (U) RESOURCES ($ in thousands)

Project Title Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Air Force Flight Test Center (AFFTC)	16,290	15,257	26,206	23,969	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The AFFTC, located at Edwards AFB, conducts and supports development test and evaluation and operational test and evaluation of aircraft and aircraft systems, aerospace research vehicles, unmanned miniature vehicles, cruise missiles, parachutes delivery/recovery systems and cargo handling systems are also evaluated. Reentry support and engineering evaluation is provided to the Space Shuttle program and other transatmospheric vehicles. AFFTC operates the USAF Test Pilot School (TPS). Integrated Flight Data Processing System (IFDAPS) is a distributed processing system for Time Space Positioning Information (TSPI) and telemetry engineering unit data. Advanced Range Data System (ARDS) is a highly accurate TSPI data and communications system which takes advantage of the Global Positioning System (GPS). The Avionics Test and Integration Complex (ATIC) will allow ground testing of the entire aircraft's integrated network software, including all flight control features as well as all avionics. The Physical Measurement Facility (PMF) project will provide for major upgrade or development of physical measurement capabilities at the AFFTC such as the weight and balance system horizontal thrust stands, moment of inertia facilities and multi-dimensional thrust stand. These projects ensure test center technology is compatible with the weapon systems to be tested such as F-16, ATF, C-17, B-2 and NASP. As a result of DMR reductions F-4 support aircraft were replaced with F-16 aircraft. Support fleet upgrade instruments these F-16 aircraft for use as test support fleet aircraft enabling uninterrupted support during the transition from F-4s to F-16s. R-2508 upgrade alleviates a safety of flight problem in the R-2508 range complex at Edwards. This is a joint AF/Navy project to increase radar coverage on the range, reducing the probability of mid-air collisions. Electronic Combat Integrated Test (ECIT) capability will enable thorough ground testing of EC equipped aircraft such as F-16, Combat Talon, and ATF. ECIT builds on existing facilities by providing EC simulators and instrumentation. FY94 IOC provides critical ECIT capability for F-16 and Combat Talon with continuing effort to provide ATF test capability.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Integrate GPS range equipment with the first ARDS processor. ($8.8M)
   - (U) AFFTC Range Instrumentation funded site preparation and ordered of Edwards Communication Switch System (ECSS), upgrade of data transmission between Edwards AFB and China Lake NWC, and installed a telemetry site and vans. ($4.5M)
   - (U) Airborne Instrumentation Support continues to upgrade laboratory equipment to support ATIS and upgrades telemetry antenna for the Test Pilot School. ($1.1M)
   - (U) Upgrade of IFDAPS display work stations and improvements of the processor continues with a demonstration of initial capability. ($2.0M)

Program Element: #0604755F Project Number: 3620
PE Title: Improved Capability for DT&E Budget Activity: #6 - Defense-wide Mission Support

2. (U) FY 1991 Planned Program:
   - (U) Acquisition and integration of ARDS equipment continues improving processing and TSPI capability. ($5.5M)
   - (U) AFFTC Range Instrumentation Upgrade completes communication hardware for two control rooms and continues telemetry antenna upgrades. ($1.3M)
   - (U) Start ATIC upgrade with emphasis on utilities modernization. ($0.2M)
   - (U) Installation and checkout of IFDAPS upgrades continues and initial design of the next generation Advanced Data Acquisition and Processing System (ADAPS) needed for ATF and C-17. ($0.7M)
   - (U) Support Fleet Instrumentation Upgrade starts to modify F-16 aircraft to replace retiring F-4s. ($3.0M)
   - (U) R-2508 Upgrade starts with acquisition of new processors and radar consoles to handle increased range coverage. ($1.8M)
   - (U) ECIT design effort begins. ($2.8M)

3. (U) FY 1992 Planned Program:
   - (U) Continue activation testing of ARDS central preprocessor with prototype RAJPO hardware. Start procurement of advanced TSPI. ($4.1M)
   - (U) AFFTC Range Upgrade involves the delivery and integration of ECSS initial configuration, procurement of ECSS hardware for two additional control rooms, continues telemetry van upgrades. ($5.7)
   - (U) PMF activities begin design for reliability upgrade of horizontal thrust stand. ($0.4M)
   - (U) Begin development of high speed ADAPS workstations and Automated Test Data Management System (ATDMS) flight test database system. ($3.8M)
   - (U) Continue ATIC systems design and start equipment acquisition. ($4.3M)
   - (U) AIS continues upgrade of laboratory equipment and begin upgrades of F-15/F-16 ground support systems. ($1.0M)
   - (U) Advanced Data Exchange Network System (ADENS) begins Phase-I expansion of AFFTC fiber optic network. ($1.4M)
   - (U) ECIT design effort continues focusing on initial integration of IFAST and TEMS. ($3.4M)
   - (U) Complete R-2508 upgrade. ($2.1M)

4. (U) FY 1993 Planned Program:
   - (U) Completion of ARDS central processor integration, delivery and checkout of first RAJPO production GPS equipment, and continuation of advanced TSPI upgrades. ($2.1M)
   - (U) AFFTC Range Upgrade include the final procurement of ECSS hardware, retrofit of telemetry van #1 with RFI suppression system, initial planning of North DATS upgrade, and procurement of additional GPS equipment. ($5.0M)
   - (U) Continue ADENS development with further expansion of base fiber network to interconnect additional test activities. ($2.3M)
   - (U) ECIT integration of IFAST and TEMS continues. ($4.9M)
   - (U) PMF activities will complete design for reliability upgrade of horizontal thrust stand. ($0.8M)
   - (U) Continue development of ADAPS and ATDMS by evaluating prototype systems and initial acquisition. ($4.8M)

Program Element: #0604755F Project Number: 3620
PE Title: Improved Capability for DT&E Budget Activity: #6 - Defense-wide Mission Support

- (U) Continue ATIC systems acquisition.and begin integration and checkout. ($2.8M)
- (U) AIS continues upgrade of laboratory equipment and upgrades large/small transport aircraft ground support systems. ($1.3M)

5. (U) Program to Completion: This is a continuing project.

D. (U) WORKED PERFORMED BY: Computer Science Corporation, Lompoc, CA (Integrated Facility for Avionics Systems Test); VERAC Incorporated, San Diego, CA (Advanced Range Data System); Scientific Applications International Corp.; Los Angeles, CA; and AFFTC in-house resources.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:
1. (U) Technical Change: Due to DMR reductions and a safety of flight problem, funds were reallocated to start support fleet upgrade program and R-2508 upgrade program. This action ensures uninterrupted test support and will alleviate flight safety problem in R-2508 complex.
2. (U) Schedule Changes: Not applicable
3. (U) Cost Changes: Due to higher priorities, funding for this program was reduced in the FY91 causing a schedule delay. In addition, Congress reduced funding during review of FY91 budget resulting in further schedule delays.

F. (U) PROGRAM DOCUMENTATION: PMD 2164(5)/0604755F Improved Capability for DT&E.

G. (U) RELATED ACTIVITIES:
- (U) Program Element 0605807F, Test and Evaluation Support.
- (U) Program Element 0604735F, Range Improvement Program.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATIONS: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE: This is a continuing project.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604756F Budget Activity: #4 - Tactical Programs
PE Title: Side Looking Airborne Radar (SLAR)

A. (U) RESOURCES ($ In Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2037 SLAR Sensors	7,395	4,098	4,166	4,342	Cont	TBD
Total	7,395	4,098	4,166	4,342	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The SLAR program develops advanced components and subsystems for high resolution imaging radars. These components are capable of collecting radar imagery of ground targets from airborne platforms, transmitting the data to ground stations, and processing and exploiting intelligence information from the imagery. Imaging radar systems provide standoff reconnaissance for targets in day/night or all-weather conditions. Advanced systems with components developed in this program element can collect, process, exploit, and report intelligence information

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 and FY 1993:

1. (U) Project 2037, SLAR Sensors: Develops advanced airborne and ground SLAR components.

(U) FY 1990 Accomplishments:
- (U) Continued ASARS Processing Segment (APS) development.
- (U) Continued APS training and integration support for the TR-1 Ground Station (TRIGS).

(U) FY 1991 Planned Program:
- (U) Complete APS training and integration support.
- (U) Design modifications for ASARS technology.
- (U) Begin designs to tailor SLAR exploitation techniques for ASARS-capable systems.

(U) FY 1992 Planned Program:
- (U) Continue for ASARS-capable systems.

Program Element: #0604756F Budget Activity: #4 - Tactical Programs
PE Title: Side Looking Airborne Radar (SLAR)

(U) FY 1993 Planned Program:
- (U) Complete advanced ASARS studies.
- (U) Publish design specifications for

(U) Work Performed By: The major contractor for SLAR is Hughes Radar Systems Group, Culver City, CA.

(U) Related Activities:
- (U) Program Element #0207215F, TR-1 Squadrons
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

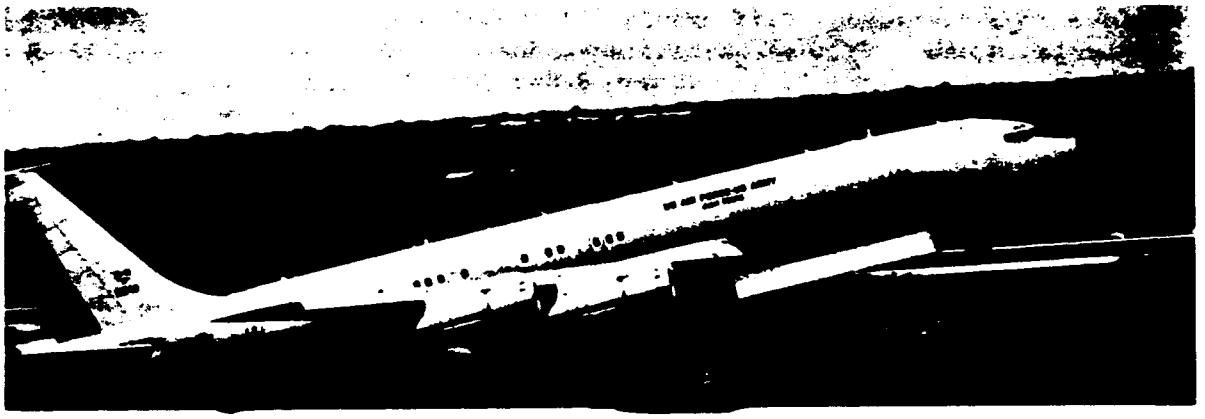
(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604770F
PE Title: Joint STARS

Project: N/A
Budget Activity: #4 - Tactical Programs

Project Title: N/A



POPULAR NAME: Joint STARS

A. (U) SCHEDULE/BUDGET INFORMATION ($ in Thousands):

BUDGET (000)	FY 1990	FY 1991	FY 1992	FY 1993	(TO COMPLETE)
Major Contract	53,814	151,332	244,922	256,938	176,335
Support Contract	16,800	22,500	25,752	22,130	96,672
In-House Support	4,400	5,468	10,278	11,473	44,826
GFE/ Other	10,400	11,183	30,907	31,757	116,247
TOTAL*	85,414	190,483	311,859	322,298	434,080
SCHEDULE	FY 1990	FY 1991	FY 1992	FY 1993	(TO COMPLETE)
Program Milestones	OFD-1 4QFY90	SLPV Start 3QFY91		DAB IIIA 2QFY93	DAB IIIB 4QFY95
Eng. Milestones	FSD Flight Testing Continues				
T&E Milestones		Combined Govt DT/IOT&E Start 4QFY91			DT/MOT&E Complete 3QFY95
Contract Milestones		Follow-on FSD Cont. Award 1QFY91	Prod. Adv. Procurement 2QFY92		

* NOTE: Budget does not reflect deployment costs

Program Element: #0604770F Project: N/A
PE Title: Joint STARS Budget Activity: # 4 - Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: There is an Army and Air Force need to provide, from airborne platforms, near-real-time surveillance and targeting information on moving and stationary ground targets (growth to maritime operations), slow moving rotary and fixed-wing aircraft, and rotating antennas. This information would enable operational and tactical commanders to make and execute battle decisions. To meet these needs, the Air Force and Army initiated the Joint Surveillance Target Attack Radar System (Joint STARS) program with the Air Force as lead service. Joint STARS will be capable of wide area surveillance, detection, location, classification, tracking, and monitoring of moving targets. The system will also be capable of providing target information for pairing direct attack aircraft and standoff weapons against selected targets. The system will be capable of being cued by other reconnaissance, surveillance, and target acquisition systems and will be able to respond rapidly to worldwide contingencies and will provide surveillance and attack information in all light and near-all-weather conditions.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) An Early Look deployment to Europe was conducted in Feb 90, with four successful test missions flown over Germany.
   - (U) An Operational Field Demonstration (OFD-1) was conducted in Europe in Sep-Oct 90, with demonstrations for US and Allied representatives. The OFD was an unqualified success.

2. (U) FY 1991 Planned Program:
   - (U) System Level Performance Verification (SLPV) will begin for the purpose of certifying exit criteria for Advance Buy.
   - (U) Government DT/MOT&E will commence.
   - (U) Nonrecurring engineering, refurbishment, and modifications to the production-representative (third FSD) aircraft will continue.
   - (U) As an unplanned event, both Joint STARS FSD aircraft were deployed in Jan 91 to support Operation Desert Storm.

3. (U) FY 1992 Planned Program:
   - (U) Advanced procurement decision and authorization will be made.
   - (U) Increased engineering and start of modification work on the production-representative aircraft will continue.
   - (U) Government DT/MOT&E will continue.

4. (U) FY 1993 Planned Program:
   - (U) Milestone IIIA (Limited Rate Initial Production) will be reached.
   - (U) Engineering and modification work on the production-representative aircraft will continue.
   - (U) Efforts on the first production aircraft will commence and advanced procurement for the 2nd lot will begin.

Program Element: #0604770F
Title: Joint STARS

Project: N/A
Budget Activity: #4 - Tactical Programs

5. (U) Program to Completion:
   - (U) Government DT/MOT&E will be completed
   - (U) Milestone IIIB Full Production decision, 4Q FY95.
   - (U) Follow-On Operational Test and Evaluation will be conducted.
   - (U) The Joint STARS system will be deployed worldwide.
   - (U) IOC, 2Q FY97.

D. (U) WORK PERFORMED BY: The major contractors are Grumman Melbourne Systems Division, Melbourne FL and Motorola Corp, Tempe AZ. The Joint Program Office is located at Electronics Systems Division, Hanscom AFB MA, and the Army Communications and Electronics Command is located at Ft Monmouth NJ.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: Milestone IIIB has been shifted from 1Q FY95 to 4Q FY95. Completion of DT/MOT&E has also changed from 4Q FY94 to 3Q FY95. These changes reflect a later than anticipated delivery of the production representative aircraft caused by the late award of the contract, funding adjustments, and program changes due to Congressional reductions.

3. (U) COST CHANGES: The FY92 PB reflects the DAB 1989 directed program restructure, the decrease in total number of aircraft, and schedule changes.

F. (U) PROGRAM DOCUMENTATION:

- (U)	TAF SON 309-82 (S)	Jun 82
- (U)	USAF/USA MOU	Apr 85
- (U)	JSORD (S)	Oct 89
- (U)	OUE 1 (S)	Feb 88
- (U)	DCP (DAB IIB) (S)	Apr 88
- (U)	ADM (DAB IIB)	Jul 88
- (U)	DCP (Oct 89 DAB)	Oct 89
- (U)	ADM (Oct 89 DAB)	Nov 89
- (U)	JROCM-065-90	Sep 90

G. (U) RELATED ACTIVITIES:

- (U) PE 0603790D, Joint STARS NATO Cooperative Development Project.
- (U) PE 0604770A, The Army RDT&E Joint STARS Program.
- (U) The Army Joint STARS Ground Station Module procurement is funded under Army Other Procurement Program.
- (U) PE 0604270F, Electronic Warfare, contains $144.9 million of RDT&E funds to develop/test the Self-Defense Suite for the E-8 aircraft.
- (U) PEs 0603770F and 0604770F/0604770D replace PEs 0603747F and 0604616F, Pave Mover.
- (U) In May 1982 OSD designated the Air Force as the lead Service.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

Program Element: #0604770F Project: N/A
PE Title: Joint STARS Budget Activity: #4 - Tactical Programs

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

	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
1. (U) Procurement: PE 027581F/(BA4 & BA6)						
Cost	0	0	68434	456472	4235111	4760017
Quantity					19	19
2. (U) Military Construction:	0	0	16400	0	101530	117930

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: The Air Force initiated a Joint STARS NATO Cooperative R&D program (PE 0603790D, Project 3639) in FY87. Systems involved are the French ORCHIDEE heliborne surveillance system, Italian CRESO (similar to ORCHIDEE) system, US Joint STARS, and UK ASTOR Technology Demonstrator Program (ASTOR TDP). Three separate cooperative efforts have been developed. First, the US/UK joint Standoff Radar Program Studies (SORPROS), includes: alternate platform studies; threat vulnerability studies; impact of integration of Standoff Radars (SOR) into existing C3I networks; and, the impacts of SOR on NATO Follow-On Forces Attack (FOFA) doctrine. Second, the Airborne Radar Demonstrator System (ARDS) cooperative agreement to demonstrate technical feasibility of air to ground interoperability between Joint STARS, ORCHIDEE, and ASTOR TDP. Third is a program to study and develop options for an interoperable data link to link the three systems in NATO. The SORPROS and interoperable data link studies are funded by Nunn Amendment funds. All three cooperative programs are nearing completion. The ORCHIDEE cancellation in Aug 90 impacted the ARDS and SIDL, but not before publication of the final reports. SORPROS is due to publish its results in mid-1991.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

Event	Date	Results
CDT&E	4Q FY 88 - 4Q FY 90	Successful flight tests accomplished

T&E ACTIVITY (TO COMPLETION)

Event	Planned Date	Remarks
Contractor DT&E	1Q FY91 - 3Q FY91	Includes SLPV for Advanced Buy Criteria
Contractor/Gov't SLPV Completion	4Q FY91 - 4Q FY92	On Aircraft 1 and 2
3rd Aircraft Mod/ Upgrade/Test	1Q FY92 - 4Q FY94	Install, Checkout Gov't Test
MOT&E	1Q FY95 - 3Q FY95	Dedicated Multi-Service Operational

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604779F Budget Activity: #4 - Tactical Programs
PE Title: Joint Interoperability of Tactical Command and Control Systems (JINTACCS)

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
NONE Joint Interoperability of Tactical Command and Control Systems (JINTACCS)	4,728	4,680	5,622	7,521	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: JINTACCS is a joint interoperability program to improve the operational effectiveness of service (Army, Navy, Air Force and Marine Corps) Tactical Command & Control (C2) Systems used in support of joint operations. The program element supports Air Force participation in the JINTACCS Program with the Army, Navy and Air Force, and the Joint Tactical Command, Control and Communications (C3) Agency which acts as the Executive Agent. Service and agency activities are governed by jointly agreed upon and Joint Chiefs of Staff (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. Elements of the Tactical Air Intelligence System, E-3 Airborne Warning and Control System, and Joint Tactical Information Distribution System (JTIDS) participate in this program. The JINTACCS program (formerly GAMO) is directed by JCS Memorandum (SM) 205-72 dated 1 April 1971, as modified by a Secretary of Defense memorandum, "Reorganization of the DoD Program to Achieve Interoperability of Tactical C2 Systems for Ground and Amphibious Military Operation (GAMO)," dated 2 Aug 1977. The program complies with requirements of DoD Directive 4630.5, "Compatibility and Interoperability of Tactical C3 and Intelligence (C3I) Systems." The structure of the program is established by the JINTACCS Program Summary which is reviewed and approved annually by the Assistant Secretary of Defense for C3I. Tactical Air Forces Required Operational Capability 306-74 (validated 4 Oct 74) is the requirement supporting JTIDS.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Joint Interoperability of Tactical Command and Control Systems (JINTACCS): The JINTACCS program entails development, testing, implementation and configuration management of message text formats (MTF) and data link standards; and support of maintenance and testing of MTF and data link operational standards. This project supports the efforts to ensure C^3 systems interoperability among all the CINCs, DoD agencies, and the services.

Program Element: #0604779F Budget Activity: #4 - Tactical Programs
PE Title: Joint Interoperability of Tactical Command and Control Systems (JINTACCS)

(U) FY 1990 Accomplishments:
- (U) Fielded initial generic MTF parser (Phase 1).
- (U) Continued development of TADIL-J capability for F-15.
- (U) Continued research of technical integration in US, NATO, DOD and intelligence data base element structures received support.
- (U) Began evaluation of U.S. message text formats (USMTF) by operator-generated queries.

(U) FY 1991 Planned Program:
- (U) Field the initial version of the generic MTF parser (Phase 2).
- (U) Continue evaluation of USMTFs by operator-generated queries.
- (U) Begin development of capability to generate USMTFs from data base.
- (U) Continue development of TADIL-J capability.
- (U) Begin equipment acquisition for E-3 Operational Facility (OPFAC) integration into the Air Force testbed for TADIL-J testing.
- (U) Support development of architecture to implement integrated data element structures into all C^3I systems.

(U) FY 1992 Planned Program:
- (U) Continue development of TADIL-J capability.
- (U) Begin Integration of Modular Control Equipment (MCE) OPFAC into the Air Force test facilities.
- (U) Begin Air Force testing of the TADIL-J message standard.
- (U) Start integration of E-3 OPFAC into Air Force testbed for TADIL-J testing.
- (U) Continue advanced MTF message preparation and processing software development.
- (U) Continue development of architecture to implement integrated data element structures into all C^3I systems.

(U) FY 1993 Planned Program:
- (U) Begin joint service testing of TADIL-J message standard.
- (U) Begin Air Force/joint service testing of TADIL-J in E-3.
- (U) Continue development of TADIL-J capability.
- (U) Begin Air Force/joint service testing of TADIL-J in MCE.
- (U) Continue advanced MTF message preparation and procession software development.
- (U) Begin implementation of rule changes to the MTF standard.

(U) Work Performed By: The Tactical Air Command (HQ TAC/DRI), Langley AFB, VA, has the coordinating and implementing authority. Management responsibility for RDT&E funding is assigned to the Air Force Systems Command, Andrews AFB, MD. The Tactical Air Command provides operational support, involving a Participating Test Unit (PTU) at the Air Force Tactical Systems Interoperability Support Center at Langley AFB, VA, to support compatibility and interoperability testing and operational effectiveness demonstrations. The JINTACCS contractors are the COMPTEK Research, Inc., Buffalo, NY, and the MITRE Corporation.

Program Element: #0604779F Budget Activity: #4 - Tactical Programs
PE Title: Joint Interoperability of Tactical Command and Control Systems (JINTACCS)

(U) Related Activities:
(U) PE 0604780M, Joint Interoperability for Tactical Command Control Systems.
(U) PE 0604779N, JINTACCS Program.
(U) PE 0604779A, JINTACCS.
(U) PE 0208045D, C^3 Interoperability/Joint Tactical C^3 Agency
(U) PE 0208298D, Management Headquarters.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Applicable Funds:
(U) Not Applicable

(U) International Cooperative Agreements:
(U) Not Applicable

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605101F Budget Activity: #6-Defense-Wide Mission Support
PE Title: Project Air Force

A. (U) RESOURCES ($ In Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	TO Complete	Total Program
XXXI Project AIR FORCE,	23,320	21,571 *	22,488	23,921	Cont	TBD
Total	23,320	21,571 *	22,488	23,921	Cont	TBD

* Funding does not accurately reflect Air Force directed level of effort.

B. (U) BRIEF DESCRIPTION OF ELEMENT: Program funds Project Air Force (PAF), AF Studies and Analysis Federally Funded Research and Development Center. It provides for continuing analytical research across a broad spectrum of issues and concerns. PAF research agenda are focused primarily on mid- to long-term concerns. Results and analytical findings directly impact senior management deliberations on major issues. Air Force Advisory Group (AFAG), chaired by AF Vice Chief, reviews, monitors, and approves PAF research effort. Each project is initiated, processed, and approved IAW AFR 20-9 which requires General Officer (or SES equivalent) sponsorship and involvement on a continuing basis.

C. (U) JUSTIFICATION FOR PROJECT MORE THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) XXXI, Project AIR FORCE:

(U) FY 1990 Accomplishments:
- (U) PAF is organized into four research programs: National Security Strategies, Theater Force Employment, Aerospace and Strategic Technology, Resource Management and Systems Acquisition.
- (U) Principal research efforts included security planning for Europe post CFE; Persian Gulf strategy; roles, missions and force mixes for the future strategic aerodynamic forces; joint close support; ATF avionics effectiveness; costs and benefits of composite wing organizations; future US Air Force roles, missions and force requirements under constrained budgets; enhancing the design infrastructure of the aerospace industry; space support of terrestrial operations; and new planning methods relating strategies to tasks. Direct assistance studies included the feasibility of two-level maintenance, and initiation of data collection on the Desert Shield Phase I deployment.

(U) FY 1991 Planned Program:
- (U) Research will continue on those topics identified as major issues by the Air Force Advisory Group. Specific research areas include future national security strategies; protecting US long-term interests in Southwest Asia; Moscow's alternative

Program Element: #0605101F Budget Activity: #6-Defense-Wide Mission Support
PE Title: Project Air Force

defense, foreign, and economic policies; Turkey's future strategic orientation; tactical C3I support of contingency operations; investment strategies for future tactical air capabilities; tactical stealth/counter stealth assessments; enhancing Air Force systems capabilities through an improved requirements process and expanding USAF missions. A major direct assistance study assessing Operation Desert Storm has also begun.

(U) FY 1992 Planned Program:
- (U) Specific new topics will evolve from the major issues established by the AFAG. Research will continue in those areas where PAF has developed special expertise and can make unique contributions to the AF. Major research efforts will likely focus on the future of deterrence in a multi-polar world, global and regional security trends, space-based capabilities, long range force projection, and improving the military requirements/system acquisition process. Special emphasis will likely continue on ensuring a future Air Force with the proper balance of force structure, technological modernization, and operational readiness in view of prospective and negotiated arms control agreements and constrained resources.

(U) FY 1993 Planned Program:
- (U) While specific topics will naturally evolve, research will continue in those major areas where PAF can make unique contributions to the AF. Major research efforts will cover the future of deterrence in a multi-polar world, global and regional security trends, space-based capabilities, improving theater-level campaign models, force projection needs and capabilities, supporting the Air Force of the future, and improving the acquisition process.

(U) Work Performed By: The RAND Corporation, Santa Monica, CA.

(U) Related Activities:
- (U) PAF efforts span functional and organizational boundaries. As a result, the research conducted relates to a wide spectrum of AF activities.
- (U) The results are deposited with the Defense Technical Information Center for appropriate dissemination to other qualified recipients.
- (U) To assure relevance and to prevent unnecessary duplication, each newly proposed research effort is reviewed by the AF Assistant Chief of Staff for Studies and Analysis.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605306F Budget Activity: #6-Defense Wide Mission Support
PE Title: Ranch Hand II Epidemiology Study

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2767 Ranch Hand II Epidemiology Study						
	1,364	1,510	9,710	10,053	Cont	TBD
Total	1,364	1,510	9,710	10,053	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program was directed in 1980 by the Assistant to the President of the United States for Domestic Affairs and Policy upon the recommendation of the Interagency Working Group on the Possible Long-Term Effects of Phenoxy Herbicides and Contaminants. As a result of this Presidential direction, PE 0605306F was established to conduct a 20-year epidemiology investigation of approximately 1200 Air Force personnel who were involved with aerial spraying of herbicides in Vietnam from 1962 to 1971 (Operation Ranch Hand). The objective of this investigation is to determine whether long-term health effects exist and can be attributed to occupational exposure to phenoxy herbicides and their associated dioxins. Dioxin is an unwanted by-product from manufacturing Herbicide Orange.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) Project 2767, Ranch Hand II Epidemiology Study: This project involves a 20-year study that compares USAF Ranch Hand personnel to other USAF crew members and support personnel who were not exposed to herbicides while serving in Vietnam. Approximately 2200 individuals are left in the study. Analyses of yearly mortality rates and the past and present health status of the study population were begun in 1982, with follow-on health examinations scheduled at the 3, 5, 10, 15, and 20 year time periods (with attendant funding requirements in examination years). A recent discovery in Lab Techniques now enables the accurate measurement of the amount of exposure to dioxin that the Ranch Hand veterans have received. Before this development, the estimates of exposure among the Ranch Hand personnel have been based on several assumptions and extrapolations (gallons of herbicide sprayed each month and the number of men assigned). However, using a new method developed by the Centers for Disease Control, the blood serum level of dioxin can be accurately assayed to provide definitive exposure assessments for each Ranch Hand study participant.

(U) FY 1990 Accomplishments:
- (U) Serum dioxin assays completed.
- (U) YR-5 Morbidity Report was published in Feb 90.
- - (U) Insufficient evidence to establish cause and effect between herbicide exposure and health effects in exposed populations.
- (U) Statistical analyses using serum dioxin data continued.
- (U) Fertility and mortality analyses continued.

Program Element: #0605306F Budget Activity: #6-Defense Wide Mission Support
PE Title: Ranch Hand II Epidemiology Study

(U) FY 1991 Planned Program:
- (U) Completed serum dioxin analyses.
- (U) Published contracted report.
- (U) Release Morbidity Report with serum dioxin data.
- (U) Publish Fertility Report.
- (U) Publish Mortality Report.
- (U) Continue database management and updating.

(U) FY 1992 Planned Program:
- (U) Award YR-10 contract by Oct 91.
- (U) Conduct YR-10 physical examinations and distribute questionnaires.
- (U) Serum dioxin assays initiated.
- (U) Database management activities will continue.
- (U) Mortality analyses will continue.

(U) FY 1993 Planned Program:
- (U) Complete YR-10 physical examinations and questionnaires.
- (U) Examination/questionnaire database verified.
- (U) Serum dioxin assays completed.
- (U) Initiate statistical analyses.
- (U) Mortality analyses will continue.
- (U) Database management will continue.

(U) Work Performed By: This program is conducted by the Epidemiology Division of the Armstrong Laboratory, Brooks AFB, TX, with program management provided by the Human Systems Program Office, Human Systems Division, Brooks AFB, TX. The prime contractor was Science Applications International Corp., McLean, VA, and the subcontractors were the Scripps Research Foundation, La Jolla, CA, and the National Opinion Research Center, Chicago, IL, for FY 91 efforts. The Air Force is currently soliciting for a new contractor. A support contractor is QuesTech, Inc., Falls Church, VA. Serum dioxin assays are performed by the Centers for Disease Control, Atlanta, GA.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense. In fact, this is the only study concerning Agent Orange health effects that is currently ongoing within the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605708F
PE Title: NAV/RADAR/SLED-TRACK

Budget Activity: #6 - Defense-wide Mission Support

A. (U) RESOURCES ($ in thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
06TG 6585th Test Group Support	21,272	19,932	21,935	23,493	Cont	TBD
2900 RATSCAT Upgrade	2,000	1,100	2,000	2,000	Cont	TBD
688G Aircraft Navigation System Verification	2,000	2,000	2,000	2,000	Cont	TBD
Total	25,272	23,032	25,935	27,493	Cont	TBD

NOTE: This is one of the six AF RDT&E Test Infrastructure accounts which provides direct support to the DoD test mission. The aggregate FY 92 budget for these accounts reflects a negative real growth in excess of 21 percent since 1968. As a result, significant technology advancements have occurred during this time period without the investment in the test infrastructure to support the advanced test capability requirements.

B. (U) BRIEF DESCRIPTION OF ELEMENT: The 6585th Test Group at Holloman AFB, NM, and the associated facilities and modernization efforts funded by Projects 06TG and 2900 are part of the DoD Major Range and Test Facility Base (MRTFB). The Test Group is a national asset which is operated and maintained primarily for DoD test and evaluation missions, but is also available to other users having a requirement for its unique capabilities. This account funds test infrastructure overhead support including: command and supervisory staffs; supply stocks; upkeep, refurbishment, repair, and replacement of worn out or obsolete test equipment; test infrastructure for data collection, transmission, reduction, and analysis; civilian salaries, utilities, temporary duty travel, support contract costs for hardware and software engineering and maintenance; and improvement and modernization projects. The unique capabilities of the 6585th Test Group include the Central Inertial Guidance Test Facility (CIGTF), the Radar Target Scatter (RATSCAT) facility, and the High Speed Test Track (Track). Project 688G directly funds DoD-chartered testing of Inertial Navigation Systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project: 06TG, 6585th Test Group Support: The 6585th Test Group, a tenant organization at Holloman AFB, New Mexico, adjacent to the White Sands Missile Range (WSMR), uses this funding for indirect support of test operations, maintenance, improvement, modernization, and personnel in five major areas. (1) The High Speed Test Track performs rocket sled testing of DoD aircraft ejection systems, explosive warheads, guidance systems, and other tests requiring realistic simulations of acceleration or high velocity environments, including rain and particle erosion. Accelerations of over 100 Gs and velocities of over 6000 feet per second are common. Upgrade efforts are underway to enable the Track to test at higher velocities to support advances in penetrators and materials; improve the efficiency of data acquisition, reduction, and analysis capabilities; and develop capability to support full-scale live fire testing of aircraft. (2) The CIGTF performs testing of DoD guidance systems, including performance and reliability verification of guidance systems and

Program Element: #0605708F
PE Title: NAV/RADAR/SLED-TRACK

Budget Activity: #6 - Defense-wide Mission Support

integrated navigational aids, such as GPS receivers and stellar trackers for aircraft. The CIGTF also conducts gravitational measurements necessary for ballistic missile guidance system testing and development. Upgrade efforts are underway to enable the CIGTF to test increasingly accurate systems and guidance system components; more efficiently test Global Positioning Systems (GPS)-aided Inertial Navigation Systems; and provide the capability to test GPS user equipment. (3) The RATSCAT facility includes two separate, yet complimentary radar cross section (RCS) measurement sites. The RATSCAT Advanced Measurement System (RAMS) provides highly secure, highly efficient, high quality measurements from VHF to MMW on sub-scale to full-scale advanced technology models up to 30,000 pounds. Main site provides the flexibility to measure monostatically and bistatically on multiple configurations ranging from sub-scale models to full-scale actual targets weighing up to 100,000 pounds. (4) The 6586th Test Squadron provides operational and maintenance support for flight test aircraft staging out of Holloman AFB. Cargo type test bed aircraft support the CIGTF; fighter type aircraft support DoD and foreign missile development tests on WSMR. (5) In addition, the 6585th Test Group provides a Deputy for Air Force to the commanding general of WSMR. This office provides the interface for all Air Force programs, is executive agent to the FAA for all WSMR airspace issues, and operates the WSMR range radar safety surveillance system.

(U) FY 1990 Accomplishments:

- (U) Completed the new Bond Measurement Facility for Advanced Radar Systems.
- (U) Acquisition continued on Improved Three-Axis Table to provide capability for testing advanced inertial systems.
- (U) Computer workstations were acquired which will afford fast, efficient analysis of data from various tests.
- (U) Provided the test preparation and infrastructure development for the High-Accuracy Ring Laser Gyroscope.
- (U) Continued Track and CIGTF test preparation and management for Rail Garrison, Peacekeeper, Advanced Concept Ejection System (ACES) II, Advanced Guidance Technology (AGT), SRAM II, the Army Kinetic Energy Munition (KEM), F-16, Crew Escape System Technology (CREST) developments, JSTARS and ATF.
- (U) Demonstrated ability for Infrared Counter-measure (IRCM) testing.
- (U) Fielded new automatic tracking system to provide accurate data during Track tests.
- (U) Continued infrastructure overhead test support of Project 688G in the development of the Advanced Reference System (ARS) and a miniaturization of CIRIS.
- (U) Continued installation and checkout of a 120-inch, 50g centrifuge.
- (U) Procure new Telemetry Processing System to improve Track responsiveness to customer requirements.
- (U) Initiated preparation for Canadian Helicopter integrated INS/GPS system flight test.

Program Element: #0605708F
PE Title: NAV/RADAR/SLED-TRACK

Budget Activity: #6 - Defense-wide Mission Support

(U) FY 1991 Planned Program:
- (U) Continue infrastructure overhead test support at Track and CIGTF support of testing for B-1/SRAM II, CREST, ATF, B-2, Kinetic Energy Missile, ACES II, Peacekeeper, Rail Garrison, and AGT.
- (U) Procure new telemetry antenna system at Track to avoid frequency encroachment by civilian users.
- (U) Complete rail alignment survey at Track and develop statement of work.
- (U) Demonstrate concept for live fire testing of full scale aircraft at Track.
- (U) Continue preparation and management for testing of standard aircraft navigation systems and equipment; and the Canadian Helicopter Integrated INS/GPS flight test.
- (U) Procure laser ranging for automatic tracking system.
- (U) Support testing the Army Multiple Launched Rocket System, the Navy Standard Missile, the Army Advanced Kinetic Energy Munition (ADKEM), the Army Line of Sight Anti-Tank (LOSAT) weapon and several other non-Air Force systems at the Track.

(U) FY 1992 Planned Program:
- (U) Continue same level of infrastructure overhead test support for standard aircraft navigation systems and Track support for B-1/SRAM II, Peacekeeper, Small Missile, and AGT with $0.9 increase for inflation.
- (U) Initiate development of the ARS as an aircraft reference system to support future navigation systems testing.
- (U) Demonstrate Test Track capability for aircraft component live fire testing.
- (U) Begin realignment of Track for $0.7M deferred from FY91.
- (U) Begin Track test support for the ATF ejection seat, F-16 ejections with Night Vision Goggles, the Hypersonic Sled Test, the Army Enhanced Kinetic Energy Warhead (EKEW), and several IRCM systems which support special operations.
- (U) Continue management infrastructure overhead support for Track testing of the Army LOSAT and ADKEM, Peacekeeper Guidance system, CREST, and AGT.
- (U) Procure Track S-Band telemetry data acquisition systems for $0.4M deferred from FY 91.

(U) FY 1993 Planned Program:
- (U) Continue infrastructure test support for aircraft navigation systems and Track support for B-1/SRAM, B-52, Peacekeeper, Advanced Guidance Technology, Peacekeeper guidance system, CREST, AGT, Army EKEW and Japanese FSX ejection seat with inflation increase of $0.9M refurbishment.
- (U) Continue to expand use of the ARS.
- (U) Initiate infrastructure overhead test support for joint live fire testing.
- (U) Complete rail alignment at Track for $0.2M deferred from FY 92.
- (U) Demonstrate Mach 10 hypervelocity capability on Track.
- (U) Initiate reimbursements to other program accounts for services provided under the Defense Business Operating Fund (DBOF) concept estimated at $0.4M.

Program Element: #0605708F
PE Title: NAV/RADAR/SLED-TRACK

Budget Activity: #6 - Defense-wide Mission Support

(U) Work Performed By: In-house (Govt) workforce, EG&G Management Systems, Inc., Albuquerque,NM, and Intermetrics, Inc., Huntington Beach CA (starting 1 January 1991).

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project: 2900, RATSCAT Upgrade. This project provides improvements to RATSCAT in order to assure support to address RCS measurement requirements of customers. The goal is to aggressively pursue upgrades to present capabilities without compromising or reducing current customer workload or security. Key areas of improvement include radar upgrades, data processing equipment, advanced target support pylons with lower radar returns, low frequency capability efforts, advanced real-time calibration equipment, engineering laboratory improvements, security equipment, efficiency related equipment, and facilities. All these areas are imperative to maintain the current capabilities and meet technologies that will use RATSCAT in the future. An extensive R&D effort continues on radar cross section reduction techniques. It is imperative to maintain the ability to measure these techniques. This project ensures a continuing effort to improve the facility to address the needs of these newer and more demanding weapon system technologies.

(U) FY 1990 Accomplishments:
- (U) Began installation of Integrated Radar Measurement System (IRMS) hardware at mainsite.
- (U) Completed design and procurement of the first of three phases to improve RATSCAT Advanced Measurement System's RCS measurement capability.
- (U) Demonstrated feasibility of concept to reduce background noise in radar cross section data.
- (U) Design of large target positioning device complete and fabrication started.

(U) FY 1991 Planned Program:
- (U) Continue installation of IRMS hardware at mainsite.
- (U) Complete procurement of the first of three phases to improve RATSCAT Advanced Measurement System's radar.
- (U) Demonstrate feasibility of concept to reduce background noise in radar cross section data.
- (U) Design of large target positioning device complete and fabrication started.

(U) FY 1992 Planned Program:
- (U) Continue IRMS Acceptance Testing. Spare parts are ordered.
- (U) Improvements to Mainsite low frequency measurements in progress.
- (U) Continue fabrication of large target positioning device.
- (U) Concept definition phase of design for low frequency radar improvements at RAMS started.
- (U) Started third phase of RAMS radar upgrade.
- (U) Procure for $0.9M security improvements deferred from previous year.

Program Element: #0605708F
PE Title: NAV/RADAR/SLED-TRACK

Budget Activity: #6 - Defense-wide Mission Support

(U) FY 1993 Planned Program:
- (U) Design improved data acquisition and processing systems.
- (U) Add imaging to West Range delayed from FY 92.
- (U) Procure additional security improvements, delayed from FY 92.

(U) Work Performed By: 6585th Test Group in-house (Govt) workforce.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project: 688G, Aircraft Navigation System Verification: Project 688G is a DoD chartered program to conduct tests and evaluations on Inertial Navigation Systems (INS) and Inertially-Aided Navigation Systems (INS-Aided) for use in aircraft and weapon delivery systems and to provide an independent assessment of the performance to benefit DoD and foreign military testers like Canada and England. The purpose of this program is to provide technical performance information on manufacturer supplied navigation systems to Air Force and Navy System Program Offices and other offices that may use these navigation systems for their off-the-shelf selection use in their aircraft or weapons delivery system; which includes most of the high accuracy weapon systems now being employed. Project 688G also provides common support for these efforts with a flight reference system called the Completely Integrated Reference Instrumentation System (CIRIS). Tasks undertaken by this project include: INS, INS-Aided testing using a GPS receiver integrated with the INS, Air Force Standard INS qualification and verification testing, Form/Fit/Function Testing, and management and maintenance of CIRIS. This project will ensure a continuing effort to provide better technology in navigation systems for use in aircraft and weapons delivery systems for the DoD as well as foreign military testers.

(U) FY 1990 Accomplishments:
- (U) Tested seven navigation systems and GPS-aided systems.
- (U) Continued development of the Advanced Reference System (ARS); a miniaturization of CIRIS into five-inch diameter AIM-9 Sidewinder pod for compatibility with additional aircraft.
- (U) Continued JSTARS support.
- (U) Began testing of GPS User Equipment (UE).
- (U) Developed and successfully tested for B-1/SRAM II a CIRIS/GPS integrated highly accurate reference system for high speed, high dynamic maneuvers and over large areas. Saved one year development time and $11M cost.

(U) FY 1991 Planned Program:
- (U) Continue testing of aircraft navigation systems and equipment, including GPS aided and GPS User Equipment .
- (U) Complete Advanced Reference System (ARS) upgrade to the CIRIS.
- (U) Provide data analysis/test assessment for B-1 and Canadian Helicopter inertial systems.

Program Element: #0605708F
PE Title: NAV/RADAR/SLED-TRACK

Budget Activity: #6 - Defense-wide Mission Support

(U) FY 1992 Planned Program:
- (U) Continue same level of testing of aircraft navigation systems and equipment, including GPS aided and GPS User Equipment (UE).
- (U) Continue direct test support of SRAM II.
- (U) Maintain time-space position information direct help to the B-52 program using CIRIS.
- (U) Continue studying ARS applications to broaden the utility of CIRIS for different reference usage.

(U) FY 1993 Planned Program:
- (U) Continue same level of testing of aircraft navigation systems and equipment, including GPS aided and GPS User Equipment.
- (U) Continue direct test support of B-1/SRAM II and B-52.
- (U) Continue to expand the use of the ARS.

(U) Work Performed By: 6585th Test Group in-house (Govt) workforce..

(U) Related Activities: Not Applicable. There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable

(U) International Cooperative Agreements: Not Applicable

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605712F Budget Activity: #6 - Defense-Wide
PE Title: Initial Operational Test and Evaluation (IOT&E) Mission Support

A. (U) RDT&E RESOURCES ($ In Thousands)

Title	FY 1990 Actual*	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Initial Operational Test and Evaluation						
PE TOTAL	-0-	15,884	26,394	29,426	Cont.	TBD

* Prior to FY 91, funding for Air Force IOT&E was programmed and executed at $22,843 in the PEs of the weapon systems.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program funds for tests conducted to evaluate a prospective system's operational effectiveness and suitability and to identify any operational deficiencies or need for modifications in support of the acquisition process. For major systems designated for use in combat, the law requires IOT&E be completed under realistic field conditions before proceeding beyond low rate initial production. This PE funds Congressionally mandated Air Force directed IOT&E to support major weapon system acquisition decisions (Milestone IIIB). In addition, this PE funds major Operational Utility Evaluations (OUEs) and Early Operational Assessments (EOAs) which support major milestones and decision points prior to the Milestone IIIB. IOT&E is essentially an operational assessment of a system's performance when the complete system is tested and evaluated against operational criteria by personnel with the same qualifications as those who will operate, maintain, and support the system when deployed. In general IOT&Es are performed on new systems in development, major modifications, and other systems as directed. This PE was established as a result of Defense Management Review Initiative G-1268, Single PE for IOT&E, approved for implementation in FY 1991.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0M IN BOTH FY 1992 AND FY 1993

(U) Initial Operational Test and Evaluation

(U) FY 1990 Accomplishments:

- (U) 79 IOT&Es conducted in 52 different Program Elements at a cost of $22,843.
- (U) Efforts included CSSR, Milstar, F-15 TEWS, CSOC, C-17, B-2, SFW, SRAM II, CCD, OTH-B, and Joint STARS.

Program Element: #0605712F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: Initial Operational Test and Evaluation (IOT&E)

(U) FY 1990 Accomplishments:

- (U) SFW - Accomplished successful deliveries of munitions on identified targets at Eglin AFB, FL (humid climate) and Camp Grayling, MI (cold weather) to evaluate effectiveness in different climates and target configurations.
- (U) Milstar - Accomplished interoperability testing with the Army and Navy to demonstrate use of each other's terminals for sending and receiving critical data.
- (U) CSOC - Supported objective of assessing capability, quality, and sustainability of the CSOC training program to enable operations and maintenance personnel to perform their mission and support functions.
- (U) C-17 - IOT&E test team was activated. Planning and preparation for test execution was on-going.
- (U) Joint STARS - Utility assessment through man-in-the-loop simulations and survivability analysis were on-going. Test concept for the Multiservice OT&E (MOT&E) was being developed.
- (U) SRAM II - Combined DT&E/IOT&E started. Began evaluating the impact of SRAM II on B-1B offensive avionics, weapon status monitoring, command and control, and missile performance and accuracy.
- (U) OTH-B - Began evaluating system capability to provide extended radar range coverage against potentially hostile aircraft.

(U) FY 1991 Planned Program:

- (U) IOT&E funding consolidated from the weapon system PEs and becomes a level of effort program under PE 0605712F. A funding level of $15,884 presents a shortfall of $13,886.
- (U) Only 23 percent of the Air Force directed IOT&E program workload is executable at this level of funding.
- (U) Includes test efforts for Milstar, SFW, OTH-B, Joint STARS, JTIDS, C-17, CSOC, and SRAM II.
- (U) Unexecutable programs include ATARS, MLS, Granite Sentry, REACT, E-3A Improvement Program, NAVSTAR, HARM LCS, SCIS, ARTS, and SPADOC IVB.

Program Element: #0605712F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: Initial Operational Test and Evaluation (IOT&E)

(U) FY 1991 Planned Program:

- (U) SFW - Testing to be completed at Nellis AFB, NV (arid climate). Delivery modes will examine level, dive, and loft geometries from various attack axes.
- (U) CSOC - Evaluate systems capability to control satellite missions of Defense Satellite Communications System, NATO, and Fleet Satellites.
- (U) SRAM II - Continue to evaluate the impact of the system on B-1B offensive avionics, weapon system status monitoring, command and control, and missile performance and accuracy.
- (U) OTH-B - IOT&E emphasis on the system's capability to provide counter-narcotics measures and imagery resolution.
- (U) Milstar - AF Terminal IOT&E begins. Evaluating capability to establish EHF/SHF communications services and the contributions of the terminal to overall system survivability.
- (U) C-17 - DT&E/IOT&E begins. Testing includes low velocity airdrops, delivering outsized equipment, high-altitude low opening, and high-altitude high opening parachute systems.
- (U) JTIDS - Assess JTIDS effectiveness and compatability in the F-15 under various mission scenarios. Testing system contribution in protecting assigned airspace and in distributing tactical information to support counter-air operations. Evaluating Class 2 terminal logistics reliability.

(U) FY 1992 Planned Program:

- (U) Funding increase is necessary from FY 91 to restore our level of effort capability, to execute FY 92 scheduled tests ($35,101), and slipped FY 91 tests ($13,886).
- (U) Funding supports the execution of 89 test programs including test efforts for JTIDS, C-17, ATARS, CSOC, SRAM T, SRAM II, Joint STARS, SFW, BMEWS Upgrade, Mobile Radar Approach Control, Civil Reserve Aeromedical Fleet, REACT, SMDPS, SCIS, F-15 TEWS, ARTS, and SPADOC.

Program Element: #0605712F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: Initial Operational Test and Evaluation (IOT&E)

(U) FY 1992 Planned Program:

- (U) ATARS - JSIPS (Joint Service Imagery Processing System) - an MOT&E to evaluate the imagery inputs accomplished through tactical JSIPS airborne sensor. Speed and clarity of target imagery processing will be made available to friendly forces for intelligence interpretation.
- (U) CSOC - Evaluate capability to control assigned Defense Support Program missions and ability to provide basic and dual node scheduling.
- (U) Joint STARS - Start of Operational Assessment and prepare for MOT&E.
- (U) JTIDS - Evaluate Class 2 Terminal in the Preplanned Product Improvement (P3I) Modular Control Equipment (MCE). Verify operational effectiveness and suitability improvements, intraservice compatability, and jam resistance.
- (U) SFW - Complete IOT&E. Submit final report.
- (U) SRAM T - Activate IOT&E test team. Test execution scheduled for Apr 93.

(U) FY 1993 Planned Program:

- (U) Increase in funding is due to higher cost-per-program generated by engaging more complex levels of technology of the systems being tested.
- (U) Complete workload has not yet been tasked, but anticipate 87 to 92 test programs.
- (U) Efforts include JTIDS, C-17, ATARS, SRAM II, Joint STARS, SRAM T, ATF, E-3 Improvements, Military Microwave Landing Systems, REACT, SMDPS, SCIS, F-15 TEWS, 60K Loader, FOTRS, ARTS, SPADOC, and Intensive High Explosives.
- (U) C-17 - Will accomplish multiservice testing to demonstrate static and engine running on/off-load of cargo, combat off-load of cargo, troop transport tests, paratroop drop, low altitude parachute extraction airdrop, air refueling, and tactical operations on small austere airfields.
- (U) Joint STARS - Begin combined DT&E/MOT&E. Testing is yet to be defined because of the systems operation in Desert Storm, but may include electromagnetic compatability and vulnerability to radio electronic combat.

Program Element: #0605712F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: Initial Operational Test and Evaluation (IOT&E)

(U) FY 1993 Planned Program:

- (U) JTIDS - Assess system on Air Force multi-platform (E-3, MCE, F-15, and Joint STARS) to verify intraservice interoperability, compatability, and jam resistance.
- (U) SRAM T - Combined DT&E/IOT&E starts. Dedicated IOT&E begins later in the year. Evaluate effectiveness and suitability of system's integration and compatability with the F-15E system.
- (U) FOTRS - Begin MOT&E. Evaluation of Unmanned Aerial Reconnaissance System (UARS) to return from a mission in a capable status. Evaluate the support structure's capability to maintain or restore UARS to an operational condition. Evaluate the degree to which UARS is operable and committed in peacetime and wartime.

(U) Work Performed By: This program element is managed by the Air Force Operational Test and Evaluation Center (AFOTEC). Test teams are established and managed by HQ AFOTEC for "Conducted" tests, and by other Major Commands for "Monitored" tests, at various locations around the world.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or DOD.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605807F
PE Title: Test and Evaluation Support

Budget Activity: #6 - Defense-Wide Mission Support

A. (U) RESOURCES ($ in thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
06RB Arnold Engineering Development Center (AEDC)	144,778	142,600	170,334	177,788	Cont	TBD
06ZA Air Force Development Test Center (AFDTC)	53,748	51,905	69,679	75,622	Cont	TBD
06YA Air Force Flight Test Center (AFFTC)	58,689	58,340	79,226	84,682	Cont	TBD
06UC 4950th Test Wing (4950 TW)	41,136	40,555	48,325	51,865	Cont	TBD
06DL Depot Level Reparables (DLR)	-0-	-0-	34,766	43,134	Cont	TBD
Total	298,351	293,400	402,330	433,091	Cont	TBD

NOTE; This is one of the six AF RDT&E Test Infrastructure accounts which provides direct support to the DoD test mission. The aggregate FY 92 budget for these accounts reflects a negative real growth in excess of 21 percent since 1968. As a result, significant technology advancements have occurred during this time period without the investment in the test infrastructure to support the advanced test capability requirements.

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Test and Evaluation (T&E) Support program provides resources to operate the above Air Force test activities which are included in the DoD Major Range and Test Facility Base (MRTFB). The MRTFB is a national asset which is operated and maintained primarily for DoD test and evaluation missions, but is also available to other users (other government agencies, commercial industry, and foreign customers) having requirements for its unique capabilities. Test facilities/ capabilities operated through this program include wind tunnels, rocket and jet engine test cells, space chambers, armament ranges, climatic test facilities, avionics test facilities, aircraft testbeds, dry lakebed landing sites, and instrumented ranges. The T&E Support program funds test infrastructure overhead support including: command and supervisory staffs; supply stocks; upkeep, refurbishment, repair, and replacement of worn out or obsolete test equipment; test infrastructure for data collection, transmission, reduction, and analysis; civilian salaries, utilities, temporary duty travel, support contract costs for hardware and software engineering and maintenance; and minor improvement and modernization projects of less than $1.0M. Starting in FY92, funds for depot level reparables will be transferred to this program element.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06RB, Arnold Engineering Development Center (AEDC): The T&E Support Project at AEDC, located at Arnold AFB, TN, provides the test infrastructure overhead support to operate the largest complex of ground test units in the free world (transonic, supersonic, and hypersonic wind tunnels; rocket motor and turbine engine test cells; space environmental chambers, hyperballistic ranges; arc heaters; and other specialized units). This project funds unique expenses such as plant upkeep; electricity and natural gas for heating, cooling, and lighting of 284 buildings (2,439,361 square feet); and the Tennessee Valley Authority demand

Program Element: #0605807F
PE Title: Test and Evaluation Support

Budget Activity: #6 - Defense-Wide Mission Support

charge for the test workload in support of the AEDC Applied Technology program. However, unlike other projects in this PE, AEDC is Air Force managed and contractor operated. Thus, this project's labor forces are 100% civilian contractor. Hence, all labor for test, test support, technology development, and base operations is funded by this project. Likewise, one of this project's most important objectives is maintenance of a core group of this workforce in order to retain the unique technological expertise required to operate AEDC. Together, these resources posture the Center to be able to test aircraft, missile and space systems at simulated flight conditions; and fund a research and technology program to develop advanced testing techniques and instrumentation required to test tomorrow's aerospace systems today. Overall, the program's prime objective is to retain the bedrock resources that have enabled AEDC to contribute to the development of virtually all of the nation's top priority aerospace programs including ICBMs; aircraft like the F-117 Stealth Fighter, the B-2 Stealth Bomber, and the Advanced Tactical Fighter; missiles such as the Patriot and the Tomahawk cruise missile; and space systems to include the Space Shuttle and the Global Positioning System satellite.

(U) FY 1990 Accomplishments:
- (U) Provided test infrastructure overhead support for reimbursable testing of programs such as the ATF, NASP, SRAM II, SDI, ASMS, F-14D, F-15E, F-16, Space Shuttle, and classified projects.
- (U) Funded salaries of 158 civilian personnel and over 2,250 operating contractors, as well as all civilian labor associated expenses (civilian awards, lump sum leave payments, moving allowance, thrift savings plan, overtime, FERs, etc).

(U) FY 1991 Planned Program:
- (U) Continues test infrastructure overhead support for reimbursable testing of programs such as the ATF, NASP, SRAM II, SDI, ASMS, AMRAAM, GBU-15, Minuteman, F-15, F100/110 engines, Space Shuttle, and classified projects.
- (U) Funds salaries of 159 civilian personnel and over 2,070 operating contractors, as well as all civilian labor associated expenses.

(U) FY 1992 Planned Program:
- (U) Continue test infrastructure overhead support including 4.4% increase to offset FY 91 to 92 inflation ($6.3M).
- (U) Fund 162 civilian personnel and over 2,226 operating contractors, as well as all civilian labor associated expenses. This includes funding for an additional 156 operating contractors than the previous FY to help AEDC recover from a layoff of over 350 contractors during FY 90 and FY 91 due to lack funding (increase of $5.2M).
- (U) Fund first year of annual State of Tennessee Beneficial Use Tax estimated at $5.3M.
- (U) Fund annual contractually mandated pay raise for operating contractor workforce ($3.6M).
- (U) Increased funds for test technology development efforts needed to test future systems (five key areas: reentry, space, hypersonics, transonics, and propulsion) deferred from past years ($3.2M).

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PE Title: Test and Evaluation Support

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- (U) Provide funds to begin work on backlog of day-to-day maintenance deferred in recent years--reduces potential program delays and enormous repair costs due to test facility breakdowns ($2.0M).
- (U) Provides overhead operating funds for new T-3 Engine Test Cell ($1.0M).
- (U) Funds $.5M increase in award fee limits for three operating/support contracts.
- (U) Funds anticipated DoD civilian pay raise ($0.3M).

(U) FY 1993 Planned Program:
- (U) Continues test infrastructure overhead support above including Tennessee Beneficial Use Tax, pay raises for operating contractors and DoD civilians, overhead for new T-3 Engine Test Cell, increased award fee limits, increased funds for test technology, and attention to previously deferred day-to-day maintenance.
- (U) Provides increase to offset 4.1% inflation from FY92 to FY93 ($7.0M).
- (U) Provides overhead operating funds for new Four Foot Transonic Wind Tunnel Independent Drive System ($.45M).
- (U) Initiate reimbursements to other program accounts for services provided under the Defense Business Operating Fund (DBOF) concept estimated at $0.2M.

(U) Work Performed By: Primary contractors performing test support include Sverdrup Technology, Inc., Calspan Corporation, and SSI Services, Inc.

(U) Related Activities:
- (U) Technical capability Improvement and Modernization tasks are funded in PE 0604755F, Improved Capability for DT&E.
- (U) Property maintenance funding for Arnold AFB, TN, Eglin AFB, FL, and Edwards AFB, CA, are funded in PE 0605894F, Real Property Maintenance (RDT&E).
- (U) Base operating support funding the Arnold AFB, TN (not including labor), Eglin AFB, FL, and Edwards AFB, CA, are funded in PE 0605896F, Base Operations (RDT&E).
- (U) T&E Investments for new tri-service common test capabilities are funded in PE 0604940D, Test Instrumentation Development.
- (U) There is no unnecessary duplication of effort within the Air Force and the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

2. (U) Project 06ZA, Air Force Development Test Center (AFDTC): The T&E Support project at AFDTC, located at Eglin AFB, FL, provides the test infrastructure overhead support for non-nuclear air armaments (including aircraft guns, ammunition, bombs, and missiles), EC systems, for DoD and allied forces. AFDTC provides multi-service climatic simulation test support and determination of electromagnetic/electro-optical weapon signature using climatic test chambers, preflight Integration of Munitions and Electronic Systems (PRIMES) facility, and Guided Weapons Evaluation Facility (GWEF), and the Electromagnetic Test Environment (EMTE) open air Electronic Combat test range. AFDTC operates a highly instrumented land/water range test complex in the Gulf area. In addition this PE funds AFDTC's overhead costs for checkout,

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training and currency flying for aircrews supporting the test mission. Funding pays salaries for a government work force of 1,194 civilians responsible for maintaining AFDTC's role as center of expertise in electronic combat and air-to-air and air-to-surface munitions integrated test and evaluation and operations and maintenance contracts employing a workforce of 1,156 people necessary to support testing on this 724 square mile land and 86,500 square mile water range.

(U) FY 1990 Accomplishments:
- (U) Provided test infrastructure overhead support to continue testing of the Sensor Fused Weapon (SFW), GBU-15/BLU-109, and F-15/ F-111 SEEK EAGLE stores certification.
- (U) Continued ground test support and EMTE range support to F-15 Tactical Electronic Warfare System DT&E/IOT&E.
- (U) Maintained instrumented ground/water ranges to support SAC OT&E of B-1B and DT&E/IOT&E of AMRAAM.
- (U) Provided infrastructure to complete weapon accuracy testing of the AGM-130

(U) FY 1991 Planned Program:
- (U) Provide test infrastructure overhead support for range operations contract to support essential existing test programs and the partial operation of three new threat radar simulators for validation testing of electronic combat systems while deferring maintenance and spare test equipment purchases supporting existing systems.
- (U) Continue test infrastructure overhead support funding to major systems including AMRAAM, JOINT STARS, ATARS, and SEEK EAGLE on the F-15E, F-111, and F-16.
- (U) Additional test programs supported will include AGM-130, MMW MAVERICK, Sensor Fused Weapon (SFW), AN/ALE-47, and Silent Attack Warning System (SAWS).

(U) FY 1992 Planned Program:
- (U) Continue test infrastructure overhead support for AMRAAM, SFW, JOINT STARS, ATARS, major electronic combat systems, and SEEK EAGLE testing with $3.6M increase for inflation and fuel adjustments.
- (U) Include $5.5M for manpower realignment from MFP 7 O&M dictated by the conversion of Eglin AFB from the Munitions Systems Division (MSD) to the AFDTC.
- (U) Converts military positions to civilian manpower for $1.0M.
- (U) Increase scope of range contract to provide full operation of three FY91 threat radar simulators, addition of widely marketed free-world defense systems, and mandated Department of Labor (DoL) contractor work increases of $1.5M.
- (U) Increase of $3.3M to provide overhead for first full year of GWEF operations including contractor support for an infrared guided weapon performance evaluation capability and a fiber-optical link between the GWEF and PRIMES facilities.
- (U) Provides $2.9M to fund deferred range equipment replacements and refurbishments of old, obsolete, high-repair equipment supporting a highly critical national electronic combat test asset.

Program Element: #0605807F
PE Title: Test and Evaluation Support

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(U) FY 1993 Planned Program:
- (U) Continue test infrastructure overhead support for major electronic combat test programs, AMRAAM, JOINT STARS, ATARS, JSIP, and SEEK EAGLE testing with decrease of $2.9M for inflation and fuel adjustments.
- (U) Continue to increase range contract for new threat systems and contractual factory maintenance support required for newer, complex computer-controlled simulators.
- (U) Provide an additional $0.9M for the military to civilian personnel conversion.
- (U) An increase of $0.4M.to develop test infrastructure to support EF-111 upgrade and ALR-56M FOT&E.
- (U) Initiate reimbursements to other program accounts for services provided under the Defense Business Operating Fund (DBOF) concept estimated at $1.8M.

(U) Work Performed By: In-house work force and VITRO Services, Ft. Walton Beach, FL.

(U) Related Activities:
- (U) Range improvement for development of electronic combat threat systems, operations/support in PE0604735F, RIP.
- (U) Depot Maintenance Funds to support Air Force Systems Command test and evaluation aircraft is contained in PE0605863F, RDT&E Aircraft Support.
- (U) Technical capability Improvement and Modernization tasks are funded in PE0604755F, Improved Capability for DT&E.
- (U) Property maintenance funding for Arnold AFB, TN, Eglin AFB, FL, and Edwards AFB, CA, are funded in PE 0605894F, Real Property Maintenance (RDT&E).
- (U) Base operating support funding the Arnold AFB, TN, Eglin AFB, FL, and Edwards AFB, CA, are funded in PE 0605896F, Base Operations (RDT&E).
- (U) T&E Investments for new tri-service common test capabilities are funded in PE0604940D, Test Instrumentation Development.
- (U) There is no unnecessary duplication of effort within the Air Force and the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

3. (U) Project 06YA, Air Force Flight Test Center (AFFTC): The T&E Support project at AFFTC, located at Edwards AFB, CA, provides test infrastructure overhead support for development and operational test and evaluation support for aircraft and aircraft systems, aerospace research vehicle, unmanned miniature vehicle, cruise missiles, parachute delivery/recovery systems, and cargo handling systems. Recovery support and engineering evaluation is provided to the Space Shuttle program and other transatmospheric vehicles. AFFTC operates two instrumented ranges: the Edwards Flight Test Range and the Utah Test and Training Range (funded in PE 0708019F by the O&M appropriation). The Center consists of the Air Force Test Pilot School (AFTPS), one Test Wing consisting of two Test Groups and eighteen Test Squadrons, and Center level

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PE Title: Test and Evaluation Support

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command and staff functions. Funding supports major generic ground test capabilities such as the Integrated Facility for Avionic Simulation Tests (IFAST), Test and Evaluation Mission Simulator (TEMS), and the Benefield Anechoic Facility (BAF) (formally known as the Air Force Anechoic Facility). In addition this PE funds AFFTC's overhead costs for checkout, training and currency flying for aircrews supporting the test mission.

(U) FY 1990 Accomplishments:

- (U) Continued test infrastructure overhead support to enable testing of the B-1B, B-2, F-16, F-15, F-15E, cruise missiles, A-7, ATF, F-111D, Gunship/Combat Talon II, X-29, AFTI-16, F-15 STOL and classified program testing.
- (U) Operations and Management of BAF transferred from Rockwell Inc. to AFFTC on 1 Sept 90. Funds support utility, civilian pay, contractor support, and other costs that "keep-the-doors-open" in sustaining a generic test capability.
- (U) Continued preparation for the C-17, National Aero-Space Plan (NASP), and Damage Info Reporting System (DIRS).
- (U) Several projects were completed or underway for the B-1B/SRAM integration and C-17 test programs. These projects were:
  - B-1B/SRAM II move to modular facilities
  - C-17 renovation of three buildings
  - C-17 equipment buys
  - C-17 test data "quick-look" facility

  Costs to plan, facilitate, prepare contract documentation/drawings, contracting efforts, etc. are included in infrastructure costs in support of test programs.

(U) FY 1991 Planned Program:

- (U) Continue test infrastructure overhead support to enable testing of the B-1B, B-1B/SRAM integration, B-2, F-16, F-15, F-15E, cruise missiles, C-17, ATF, AFTI/F-16, Gunship/Combat Talon II, X-29A, AFTI-16, DIRS, ATARS, UARS, and classified program testing.
- (U) Provide continuing level of test support efforts. Workyear funded are 643 for civilians and 283 for contractors.
- (U) Begin operation of the BAF to support increased capability for ground test of avionic systems. Funds support utility, civilian pay, contractor support, and other costs that "keep-the-doors-open" in sustaining a generic test capability.
- (U) Prepare for testing advanced, avionics intensive weapon systems in both ground test facilities (IFAST, BAF, TEMS) and flight will increase. Test infrastructure, management, and systems integration will be $0.4M.
- (U) Initiate aircraft support fleet modernization. Direct costs of instrumentation (engineering, Modification Dock, and materials) funded by this PE.

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PE Title: Test and Evaluation Support

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(U) FY 1992 Planned Program:

- (U) Continue test infrastructure overhead support to enable testing of the B-1B/SRAM integration, B-2, F-16, F-15, F-15E, C-17, cruise missiles, ATF, AFTI/F-16, Gunship/Combat Talon II, X-29A, AFTI-16, DIRS, ATARS, UARS, and classified program testing including:

4.4% inflation	2.2M
Mil/Civ Conversions	2.0
DMR Test Consolidations	1.8
(DMRD 901 Fuel Infl. ($3.0M))	
(Test Consolidation (Spt Acft) (-1.2M))	
BAF O&M (ZBT from PE 64735F)	7.0
Support Fleet modernization (operations)	3.0
Support Fleet instrumentation	2.0
Technical equipment updates	1.6
USAF TPS multi-engine curriculum requirement (C-141/C-23A use)	1.2

- (U) Provide continuing level of test support efforts. Workyear funded are 670 for civilians and 314 for contractors.
- (U) NASP preparation continues. Support consists of infrastructure, engineering and technical site design efforts to posture the Center to be ready for this test effort. These are advanced planning costs to insure the NASP test requirements integrated into the Center's test infrastructure.
- (U) Classified program testing will continue at a high rate. Classified programs requirements require higher management infrastructure costs to integrate classified and non-classified efforts. Classified programs represent 40% of our reimbursement program.
- (U) Testing avionic intensive weapon systems in both ground test facilities and flight will increase. State-of-the-art upgrades to existing systems are required to preserve these capabilities. Costs to this PE of $0.4M to include management and engineering efforts.
- (U) Aircraft support fleet modernization continues. Additional operating and field maintenance costs ($3.0M) will result from the conversion from old F-4 aircraft to more modern F-16 and F-15 aircraft.
- (U) Start replacement/modernization program for airframe and simulation systems. Specific areas are:

Air frames Systems Modernization	$0.7M
CADD Replacement	$0.9M

To keep pace with developing weapon systems and provide a generic test support, the test infrastructure requires these investments be made.

(U) FY 1993 Planned Program:

- (U) Continue test infrastructure overhead support to enable testing of the B-1B/SRAM integration, B-2, F-16, F-15, F-15E, cruise missiles, ATF, AFTI/F-16, Gunship/Combat Talon II, X-29A, AFTI-16, DIRS, ATARS, UARS, and classified program testing with inflation increases from FY92 and FY93 of $3.2M.
- (U) Workyear funded are 659 for civilians and 314 for contractors.
- (U) NASP preparation continues.
- (U) Testing avionic intensive weapon systems in both ground test facilities and flight will increase. BAF operating funds continued.

Program Element: #0605807F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: Test and Evaluation Support

- (U) Aircraft support fleet modernization continues. Instrumentation upgrade costs of support fleet in meeting general test and USAF Test Pilot School requirements.
- (U) Continue programs of replacement/modernization of aging range, shop, air frame, and simulation systems and equipment at FY92 levels.
- (U) Initiate reimbursements to other program accounts for services provided under the Defense Business Operating Fund (DBOF) concept estimated at $2.3M.

(U) Work Performed By: Primary contractor performing test support is Computer Science Corporation (CSC), Lancaster, CA.

(U) Related Activities:
- (U) Range improvement for development of electronic combat threat systems, operations/support in PE0604735F, RIP.
- (U) Depot Maintenance Funds to support Air Force Systems Command test and evaluation aircraft is contained in PE0605863F, RDT&E Aircraft Support.
- (U) Technical capability Improvement and Modernization tasks are funded in PE0604755F, Improved Capability for DT&E.
- (U) Property maintenance funding for Arnold AFB, TN, Eglin AFB, FL, and Edwards AFB, CA, are funded in PE 0605894F, Real Property Maintenance (RDT&E).
- (U) Base operating support funding for Arnold AFB, TN, Eglin AFB, FL, and Edwards AFB, CA, are funded in PE 0605896F, Base Operations (RDT&E).
- (U) T&E Investments for new tri-service common test capabilities are funded in PE0604940D, Test Instrumentation Development.
- (U) There is no unnecessary duplication of effort within the Air Force and the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

4. (U) Project 06UC, 4950th Test Wing (4950 TW): The T&E Support Project at the 4950th Test Wing, Aeronautical Systems Division, Wright-Patterson AFB, OH, provides the test infrastructure overhead support for flight tests of aircraft and airborne systems, supports space vehicle data tracking for Air Force Systems Command's (AFSC) Space Division, other DoD agencies, and the National Aeronautics and Space Administration (NASA). The Wing operates AFSC's large testbed aircraft and flight test aircraft modification facility and provides limited manufacturing support, on a non-interference basis with research and development, to Air Force and other Department of Defense components through the use of computer aided design/computer aided manufacturing (CAD/CAM). Flight tests range from evaluations of electronic systems such as radar, navigation, and C3 to aerodynamic and structural evaluations of highly modified RDT&E aircraft. Staging out of US and overseas bases, the Advanced Range Instrumentation Aircraft (ARIA) fleet of eight aircraft provide telemetry support for the NASA and DoD missile launches. In addition this PE funds the 4950TW's overhead costs for checkout, training and currency flying for aircrews supporting the test mission. Funding also supports a government work force of 838 civilians responsible for maintaining 4950 TW role as center of expertise in avionics sub-systems, CAD/CAM, and testing commercial aircraft.

Program Element: #0605807F
PE Title: Test and Evaluation Support

Budget Activity: #6 - Defense-Wide Mission Support

(U) FY 1990 Accomplishments:
- (U) Continued ARIA and other flight test support for DoD and NASA programs.
- (U) Continued support in fabrication/modification and flight test to the Wright Research and Development Center (WRDC), other DoD, and government organizations.
- (U) Delivered autoclave and six-axis milling machine to further enhance fabrication/manufacturing capabilities in composites and machine compound complex angles.

(U) FY 1991 Planned Program:
- (U) Continue test infrastructure overhead support to provide ARIA flight test support to DoD and NASA programs including Trident, Polaris, Titan, Delta Star, Scout, DMSP, MILSTAR, Landsat, DMSS, and numerous other space launches.
- (U) Continue fabrication/modification and flight test support to WRDC, other DoD and government organizations.
- (U) Electronic Counter-Countermeasures Airborne Radar Testbed (ECCM/ARTB) aircraft is scheduled for initial operation capability on a Test Wing C-141 Aircraft with full operation scheduled for FY93.
- (U) One Sonobuoy Missile Instrumentation Location System (SMILS) will enter initial operational capability.
- (U) Provide overhead to support initial operation of Cruise Missile Mission Control Aircraft.

(U) FY 1992 Planned Program:
- (U) Continue test infrastructure overhead support for ARIA and systems flight test support to DoD laboratory/ acquisition programs including increases of $3.2M for deferred equipment replacements, inflation and fuel cost adjustments.
- (U) Continue ARIA test instrumentation, Computer Aided Engineering (CAE), Computer Aided Manufacturing (CAM) and Computer Integrated Manufacturing (CIM) for fabrication and modification in support of flight test.
- (U) Purchase initial spare test equipment deferred from FY91 for Cruise Missile Mission Control Aircraft which will become fully operational with test completion on second production system.
- (U) Begin full support funding of $1.0M for three new system test capabilities; one EC-18B Sonobouy Missile Impact Locator System and two C-18D Cruise Missile Mission Control Aircraft.
- (U) Update the current contractor C-18 Maintenance Tech Orders and EC-18B modification drawing documentation to government specifications deferred from FY90 and FY91 for more efficient support and improved changes to existing aircraft test equipment for $1.2M.

(U) FY 1993 Planned Program:
- (U) Continue test infrastructure overhead support for ARIA, SMILS and flight test support with increase of $2.0M for fuel adjustment and inflation.
- (U) Purchase remainder of spare test equipment for CMMCA at $1.1M deferred from FY91 and FY92.
- (U) Continue technical order and documentation update of Test Wing aircraft with projected completion in FY94.

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PE Title: Test and Evaluation Support

Budget Activity: #6 - Defense-Wide Mission Support

- (U) Complete ECCM/ARTB and begin full support funding for the new test capability on a C-141 aircraft.
- (U) Initiate reimbursements to other program accounts for services provided under the Defense Business Operating Fund (DBOF) concept estimated at $1.5M.

(U) Work Performed By: 4950th Test Wing in-house workforce.

(U) Related Activities:
- (U) Depot Maintenance Funds to support Air Force Systems Command test and evaluation aircraft is contained in PE0605863F, RDT&E Aircraft Support.
- (U) Technical capability Improvement and Modernization tasks are funded in PE0604755F, Improved Capability for DT&E.
- (U) There is no unnecessary duplication of effort within the Air Force and the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

5. (U) Project 06DL, Depot Level Reparables (DLR): This is a zero base transfer of the funds that pay for the repair of spare parts for the aircraft fleet. Previously these funds were distributed to the depot to pay for repair parts, which were then provided to the aircraft units at no charge. Starting in FY 1992, these funds will be distributed to the individual aircraft units and they will use them to pay to have parts repaired by the depots using the stock fund principle.

(U) FY 1990 Accomplishments: N/A.

(U) FY 1991 Planned Program: N/A.

(U) FY 1992 Planned Program:
- (U) Three fourths of the funding for repair of spare parts for test aircraft.

(U) FY 1993 Planned Program:
- (U) Full year funding repair of spare parts for test aircraft.

(U) Work Performed By: This project will be accomplished by government labor.

(U) Related Activities:
- (U) The test ranges and centers provide test support to Air Force programs and those of the other services and government agencies.
- (U) Program Element #0605863F, RDT&E Aircraft Support.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605808F
PE Title: Advanced Systems Engineering/Planning

Budget Activity: #6- Defense Wide Mission Support

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Advanced Systems Engineering/Planning	6,814	8,927	16,081	22,224	Cont	TBD
Total	6,814	8,927	16,081	22,224	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Provides resources for AF Pre-Milestone I acquisition planning, in compliance with directions in the Defense Management Review and DODD 5000.1, Defense Acquisition Programs. These directives require DOD components to conduct continuing mission area analyses to identify deficiencies and determine more effective means of performing assigned missions. They also direct concept exploration/definition studies to be undertaken to evaluate potential alternative approaches to addressing an identified shortfall or exploiting an opportunity. This program provides for concept definition studies prior to Milestone I to support the Milestone I decision process. First, analysts investigate operational commanders' highest priority mission requirements as specified by AF Major Command (MAJCOM)/CCs to develop solution boundaries. Then, possible solution concepts are drawn or generated from a variety of sources. Technologies which significantly enhance warfighting capabilities, exploit adversary weaknesses, or reduce weapon system ownership costs are evaluated for incorporation into system concepts. Finally, resident analytical capabilities are used to evaluate system approaches and configurations to determine limitations and development challenges. Evaluations of alternative system concepts are provided to AF MAJCOMs for developing Statements of Need (SON).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) Advanced Systems Engineering/Planning:

(U) FY 1990 Accomplishments:
- (U) Examined concepts for the next generation intra-theater airlifter to support the Army.
- (U) Performed a mission analysis for mission and system needs for a multi-role aircraft.
- (U) Developed concepts for the next generation intercontinental ballistic missile (ICBM).
- (U) Analyzed compatibility of Modular Control Equipment with NATO's Air Command and Control System to determine possible functional role.
- (U) Analyzed system requirements and identified critical technologies for tactical night vision systems.

- (U) Investigated concepts to increase air base operability and enhance logistics support.
- (U) Assessed requirements and technology needs to support the U.S. Transportation Command C3 architecture.
- (U) Examined air support/battlefield air interdiction requirements.
- (U) Examined concept designs for a quick response, non-nuclear penetrator weapon system for global use against selective point targets based on recent technology advancements in the miniaturization of guidance and control components.
- (U) Completed trade-off study between solar and nuclear power alternatives for high-powered space systems.
- (U) Performed an analysis of MAC's C4 system to determine systems integration problems using computer-aided systems engineering tools.

(U) FY 1991 Planned Program:

- (U) Investigate concepts for mobile command centers which are survivable and enduring for extended periods of time without external support.
- (U) Support concept alternatives studies of preferred space systems and launch vehicles architectures.
- (U) Conduct a tactical weather system study to include weather observing and forecasting systems.
- (U) Develop concepts for an autonomous lethal defense weapon to support bomber, cargo, Airborne Warning and Control System, and Special Operations Forces aircraft in future conflicts.
- (U) Conduct feasibility/cost/benefit trade-off studies to establish viable concepts for directing future satellite control development towards greater interoperability and survivability.
- (U) Develop a living functional/technical "blueprint" of the MAC C4 environment.
- (U) Identify human-centered technologies, manpower, and hazardous materials evaluation for incorporation into new major weapon systems.
- (U) Develop system concept options and conduct trade-off studies to define cost-effective operational advanced training technologies system.
- (U) Identify and rank technologies to support a future tactical weapon system to defeat ground mobile targets.
- (U) Identify and timeline the F-16 human centered technical and system needs that will focus on the technology base and advanced technology development programs.
- (U) Support definition of DOD role in the Space Exploration Initiative.

(U) FY 1992 Planned Program:

- (U) Conduct comprehensive concept alternatives studies to meet future aerial refueling needs.

- (U) Define potential tactical communications architectures and required technologies to complement the 21st Century dispersed and mobile operations.
- (U) Identify SAC C3I initiatives for near, intermediate, and far term and cross-reference to applicable technology areas.
- (U) Determine specific low level ride qualities which cause arrival performance loss among passengers and develop approaches to eliminate/reduce their effect.
- (U) Analyze projected aircraft inventory and future operational concepts to define key human characteristics related to flying performance and evaluate application of these characteristics as parameters for selection, classification, waiver, and training criteria.
- (U) Examine concepts for a short range anti-air missile.
- (U) Examine further design and system engineering of a small responsive space system based on a small group of multi-role system elements.
- (U) Analyze and identify concept alternatives to exploit technical and operational consideration of integrating offensive and defensive strategic systems and associated research.

(U) FY 1993 Planned Program:
- (U) Develop a Non-Cooperative Target Identification roadmap based on current developing technologies applicable for use in upgrades or replacement of operational systems.
- (U) Accomplish Field Training System pre-FSD requirements analyses and technology assessments.
- (U) Develop and quantify alternatives for USAF pilot training from a total training system approach.
- (U) Evaluate to the sub-system level those concepts and technologies needed for full scale Electronic Orbital Transfer Vehicle design.

(U) Work Performed By: Technical analysis to evaluate concepts is primarily performed in-house with additional support provided by the Aerospace Corporation, El Segundo, CA and the MITRE Corporation, Bedford, MA. Concept development is performed by numerous system contractors and analytical service companies.

(U) Related Activities:
- (U) Projects funded by this program element evaluate integrating emerging technology into candidate systems.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands): Not Applicable.

(U) International Cooperative Assessments: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: 0605809F
PE Title: Dynamic Coherent Measurement System (DYCOMS)

Budget Activity: 6
Defense Wide
Mission Support

A. (U) RESOURCES: ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
4514 DYCOMS	8,939	15	0	1,889	TBD	N/A

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program was cancelled in Oct 90. The money in FY 93 through FY 96 was not taken out due to administrative error.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0M IN BOTH FY 92 AND FY 93:

(U) 4514 DYNAMIC COHERENT MEASUREMENT SYSTEM: (same as section B)

(U) FY 90 Accomplishments:
- (U) Pre-draft Environmental Impact Study completed
- (U) Continue risk-reduction hardware procurement

(U) FY 91 Planned Program:
- (U) Program termination decision made in Oct 90
- (U) Complete Preliminary Design Review
- (U) Complete program termination
- (U) Complete disposition of subcontracts

(U) FY 92 Planned Program:
- (U) No activities

(U) FY 93 Planned Program:
- (U) No activities.

(U) Work Performed by: Air Force Systems Command, Electronic Systems Division,Hanscom AFB, MA. Prime Contractor is EG&G, Las Vegas, Nevada.

(U) Related activities: There is no unnecessary duplication of this measurement capability within Air Force or DOD.

(U) Other appropriation funds: None.

(U) International Cooperative agreements: None.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605863F Budget Activity: #6-Defense-wide Mission Support
PE Title: RDT&E Aircraft Support

A. (U) RESOURCES ($ in Thousands)

Project Number&Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2111 Air Force Development Test Center (AFDTC)						
	10,414	10,881	8,957	7,000	Cont	TBD
2112 Air Force Flight Test Center (AFFTC)						
	35,148	28,395	17,207	24,621	Cont	TBD
2114 4950th Test Wing						
	12,684	14,973	17,339	13,700	Cont	TBD
Total	58,246	54,249	43,503	45,321	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: The RDT&E aircraft support program provides resources for maintaining Air Force Systems Command assigned test and test support coded aircraft which are included as a portion of the Department of Defense Major Range and Test Facility Base (MRTFB). This program supports 201 RDT&E aircraft of 22 different types. Most of these aircraft are unique (pre-production, one-of-a-kind, etc.) and are highly modified and uniquely instrumented. Funds pay for depot level type maintenance such as: Programmed Depot Maintenance (PDM), the calendar-based cyclic scheduling of aircraft into depots for update/inspection; modifications and any other depot level repairs required by the Aircraft System Managers; engine overhauls; repair of exchangeables (recoverable components, such as fuel pumps and electric motors, returned to the depots); depot provided area assistance; and assorted equipment support that requires reimbursement. Effective FY 1992, funds previously planned for exchangeables were zero base transferred to program element #0605807 for the new Stock Fund of Depot Level Reparables, DMRD 904.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project: 2111 Air Force Development Test Center (AFDTC): The Air Force Development Test Center (AFDTC), Eglin AFB, FL, is the prime USAF organization responsible for nonnuclear munitions armament development. AFDTC accomplishes RDT&E and initial acquisition of USAF nonnuclear munitions; is the USAF focal point for munitions integration in aeronautical systems; and conducts USAF weapons effectiveness testing and electromagnetic warfare testing. AFDTC currently has the following types and quantities of test/test support aircraft assigned: NC-130A(1); F-4D(4); F-4E(4); RF-4C(2); F-15A(2); F-15B(1); F-15C(1); F-15D(1); F-15E(2); F-16A(6); F-16B(1); F-16C(4); F-111E(3); UH-1N(2); and T-38A(5). Total aircraft assigned: 39.

(U) FY 1990 Accomplishments:
- (U) PDM accomplished on one F-15C.
- (U) Analytical Condition Evaluation (ACE) accomplished on two UH-1Ns.
- (U) Mods accomplished on six F-16s.
- (U) Special Purpose Vehicles (two P-8s and one P-12) were overhauled.
- (U) Area assistance rendered on one F-4E (Time Compliance Technical Order) and one F-15A (fuel cavity corrosion).
- (U) Eglin projected flying hours of 6,618 generated $7.4M worth of engine and exchangeable costs.

Program Element: #0605863F
PE Title: RDT&E Aircraft Support

Budget Activity: #6-Defense-wide Mission Support

(U) FY 1991 Planned Program:
- (U) PDM will be accomplished on one F-4D and one F-111.
- (U) Special inspections and fuel system improvements will be done on Eglin's UH-1Ns and four T-38s will go through the San Antonio Air Logistic Center repair line.
- (U) Special purpose vehicles (compressed gas trailer, one T-7, one P-8, and two P-12) will be overhauled.
- (U) Eglin is projecting 7,494 flying hours which will generate corresponding engine overhaul and exchangeable requirements.

(U) FY 1992 Planned Program:
- (U) PDM will be accomplished on one C-130A and one F-15A.
- (U) Analytical Condition Evaluations (ACE) will be accomplished on two UH-1Ns and one will receive an improved fuel system.
- (U) Special purpose vehicles (two MB-4s, two P-8s, one P-12, and one compressed gas trailer) will be overhauled.
- (U) Eglin is projecting 8,003 flying hours which will generate corresponding engine overhaul requirements.

(U) FY 1993 Planned Program:
- (U) PDM will be accomplished on one F-15 and one F-111E.
- (U) The annual Analytical Condition Evaluation will be accomplished on two UH-1Ns.
- (U) Special purpose vehicles (one R-9, two P-12s, two MB-2s,and nine MB-4s) will be overhauled.
- (U) Eglin is projecting 6,260 flying hours which will generate corresponding engine overhaul requirements.

(U) Work Performed By: Depot level maintenance is performed either organically (by the Air Force Logistics Command (AFLC) Air Logistics Centers (ALCs)) or contractually (with the ALCs negotiating/ administering the contract). Organically, work is performed at five AFLC ALCs. Contractually, work is performed by McDonnell Douglas Corp., Tulsa, OK; Boeing Military Airplane Company, Wichita, KS; Lockheed, Marietta, GA; Hayes International, Birmingham, AL; and Vought Corp., Dallas, TX.

(U) Related Activities: Operation of the aircraft supported by this program is in Test and Evaluation Support, PE0605807F. There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project: 2112, Air Force Flight Test Center (AFFTC): The Air Force Flight Test Center (AFFTC), Edwards AFB, CA, conducts and supports tests of aircraft and aircraft systems, aerospace research vehicles, remotely piloted vehicles, cruise missiles and parachute delivery/recovery systems. Support for the Air Force Flight Test Center (AFFTC) aircraft located at the 6514th Test Squadron at Hill AFB, UT, is also funded within this project. The AFFTC currently has the following types and quantity of test/test support aircraft assigned: A-7D/F/K(15), NA-37B(3), B-1(2), B-2(2), B-52G(1), B-52H(2), FB-111A (1), DC-130A(1), C-130B(2), C-130H(5), F-4C(4), RF-4C(4), F-4D(2), F-4E(10), F-15A(3), F-15B(2), F-15D(3), F-15E(3), F-16A(6), F-16B(7), F-16C(6), F-16D(2), HH-1H(4), UH-1N(3), H-3E(3), CH-53A(2), UH-60L(2), T-38A(22), UV-18B(1), U-26A(1), and U-6(1). Total aircraft assigned: 125.

Program Element: #0605863F
Title: RDT&E Aircraft Support

Budget Activity: #6-Defense-wide PE Mission Support

(U) FY 1990 Accomplishments:
- (U) PDM was accomplished on one HC-130H, one NC-130H, one F-4E, and one RF-4C.
- (U) One HH-1H underwent extensive On-Condition Maintenance.
- (U) Analytical Condition Evaluation was accomplished on four HH-1Hs, two UH-1Hs, and one CH-53A.
- (U) Area assistance was rendered for F-15D stabilizer repairs, NF-4E spoiler hinge repairs, F-4D environmental control problems, two F-4E cracked shrouds, two F-15D wing changes, one F-111 motor change, and one F-111 corrosion repair.
- (U) Mods were accomplished on six F-16s and two T-38s.
- (U) Wing spar inspection was accomplished on one A-37.
- (U) HAVE PHOENIX support cost $4.238M.
- (U) Edwards and Hill projected 26,349 flying hours generated $26.1M worth of engine overhaul and exchangeable costs.

(U) FY 1991 Planned Program:
- (U) PDM will be accomplished on the NC-130B, three RF-4C, two F-4Es, one F-15A, and one F-15D.
- (U) Analytical Condition Evaluation will be accomplished on seven H-1s and two CH-53As. The CH-53As will also receive self-sealing fuel lines. Special repairs/mods will be accomplished on ten T-38s.
- (U) HAVE PHOENIX costs are projected at $4.5M.
- (U) Special purpose vehicles (one MB-4, one R-9, one 25K loader, one P-12, and four P-2s) will be overhauled.
- (U) Edwards and Hill are projecting 27,572 flying hours which will generate corresponding engine overhaul and exchangeable requirements.

(U) FY 1992 Planned Program:
- (U) PDM will be accomplished on one C-130B, two F-4s, and two F-15s.
- (U) Analytical Condition Evaluation will be accomplished on the H-1s and CH- 53As.
- (U) The A-7s will be input for mod and F-16s will be input for repair/mods.
- (U) Special purpose vehicles (three MB-4s, four R-9s, four compressed gas trailers, one P-8, and one P-4) will be overhauled.
- (U) Edwards and Hill are projecting 24,871 flying hours which will generate corresponding engine overhaul requirements.

(U) FY 1993 Planned Program:
- (U) PDM will be accomplished on one F-15A and one C-130B.
- (U) Edwards F100 engines will be modified to the 220E configuration. Due to the large amount of effort required, the work has been split between FY93 and FY94.
- (U) Analytical Condition Evaluation will be accomplished on the H-1s and CH- 53As. Six F-16s will be input for mod/repair/paint.
- (U) Special purpose vehicles (ten compressed gas trailers, three MB- 4s, one R-9, one P-8, one P-2, and a 10K fork lift) will be overhauled.
- (U) Edwards and Hill are projecting 23,733 flying hours which will generate corresponding engine overhaul requirements.

Program Element: #0605863F
PE Title: RDT&E Aircraft Support

Budget Activity: #6-Defense-wide Mission Support

(U) Work Performed By: Depot level maintenance is performed either organically (by the Air Force Logistics Command (AFLC) Air Logistics Centers (ALCs)) or contractually (with the ALCs negotiating/ administering the contract). Organically, work is performed at five AFLC ALCs. Contractually, work is being performed by McDonnell Douglas Corp., Tulsa, OK; Boeing Military Airplane Company, Wichita, KS; Lockheed, Marietta, GA; Hayes International, Birmingham, AL; and Vought Corp., Dallas, TX.

(U) Related Activities: Operation of the aircraft supported by this program is in Test and Evaluation Support, PE0605807F. There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project: 2114, 4950th Test Wing: 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 organizations. The 4950th Test Wing currently has the following types and quantities of test/test support aircraft assigned: C-18A(2); C-18B(1); EC-18B(4); C-135A(9); C-135E(7); C-141A(4); T-37B(1); T-39A(3); and T-39B(6). Total assigned: 37. Aeronautical Systems Division, Wright-Patterson AFB, OH, is responsible for aircraft leased to contractors, loaned to other Government agencies, or furnished to contractors under Government Furnished Property (GFP) clauses. The Air Force programs and pays for support of these aircraft through the 4950th Test Wing account. Based on current and projected contracts and agreements, AFSC is responsible for costs associated with one NC-131H and one NT-33A. Cost for these aircraft are included in the 4950 Test Wing Project.

(U) FY 1990 Accomplishments:
- (U) PDM was accomplished on three C-135s.
- (U) Special inspections were accomplished on the NC-131H and NT- 33A.
- (U) C-18 component overhaul and sustaining engineering support cost $2.975M.
- (U) Time Compliance Technical Orders were accomplished on four C- 141s.
- (U) Area assistance was rendered to remove the pyro devices from an NF-111A before it was put on static display at NASA/Edwards.
- (U) The 4950th Test Wing had 8,528 flying hours which generated engine overhaul and exchangeable costs of $4.0M.

(U) FY 1991 Planned Program:
- (U) PDM will be accomplished on two C-18s, five C-135s, and one C-141.
- (U) C-18 Component Overhauls and Sustaining Engineering is projected to cost $3.8M.
- (U) Special inspections are required to ensure the structural integrity/flight worthiness of the NC-131H, NT-33A, and T-37 aircraft.
- (U) The 4950th Test Wing is projecting 8,273 flying hours which will generate corresponding engine overhaul and exchangeable requirements.

Program Element: #0605863F
PE Title: RDT&E Aircraft Support

Budget Activity: #6-Defense-wide Mission Support

(U) FY 1992 Planned Program:
- (U) PDM will be accomplished on two C-18s, seven C-135s, and two C-141.
- (U) On-going special inspections will be accomplished on the NC-131H and NT-33A.
- (U) C-18 Component Overhauls and Sustaining Engineering is projected to cost $4.1M.
- (U) The 4950th is projecting 8,528 flying hours which will generate corresponding engine overhaul requirements.

(U) FY 1993 Planned Program:
- (U) PDM will be accomplished on two C-18s and four C-135s.
- (U) On-going special inspections will be accomplished on the NC-131H and NT-33A.
- (U) C-18 Component Overhauls and Sustaining Engineering is projected to cost $4.5M.
- (U) The 4950th is projecting 8,528 flying hours which will generate corresponding engine overhaul requirements.

(U) Work Performed By: Depot level maintenance is performed either organically (by the Air Force Logistics Command (AFLC) Air Logistics Centers (ALCs)) or contractually (with the ALCs negotiating/ administering the contract). Organically, work is performed at five AFLC ALCs. Contractually, work is being performed by McDonnell Douglas Corp., Tulsa, OK; Boeing Military Airplane Company, Wichita, KS; Lockheed, Marietta, GA; Hayes International, Birmingham, AL; and Vought Corp., Dallas, TX.

(U) Related Activities: Operation of the aircraft supported by this program is in Test and Evaluation Support, PE0605807F. There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605894F
Title: Real Property Maintenance Activity (RPMA)

Budget Activity: 6-Defense-Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
8941 Operation of Utilities	15,884	17,534	20,717	21,484	Cont	TBD
8942 Maintenance and Repair of Real Property	47,026	40,606	51,557	25,379	Cont	TBD
8943 Minor Construction	2,784	2,895	3,008	0	Cont	TBD
8944 Other Support	16,228	16,877	17,535	18,184	Cont	TBD
06EC Environmental Compliance	3,108	3,632	12,306	1,420	Cont	TBD
Total	85,030	81,544	105,123	66,467	Cont	TBD

NOTE: This is one of the six AF RDT&E Test Infrastructure (PEs 0604755F, 0605708F, 0605807F, 0605863F, and 0605896F) accounts which provides direct support to the DOD test mission. Although there is significant growth from FY 91 to FY 92, it reflects programmatic adjustments and transfers. The aggregate FY 92 budget for these accounts still reflects a negative real growth in excess of 21 percent since 1968. During that time period, significant technology advancements have occurred without the investment in the test infrastructure to support the advanced test capability requirements.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides essential RPM operations at three Air Force Systems Command Major Range and Test Facility Bases (MRTFBs) -- Eglin AFB, FL; Edwards AFB, CA; Arnold AFB, TN. The account funds essential "open the doors" cost of day-to-day operations of a physcial plant with a replacement value of over $7 billion. Physical plant maintained by this account covers: 800,000 acres of land; over four thousand structures in excess of 30 years old; encompassing fifteen million sq ft; over five million sq yards of airfield pavement; 1900 miles of road network (six times the road network of the District of Columbia); utility systems which include 120 wells, 10 sewage treatment plants, 20 substations and over 1600 miles of high voltage electrical distribution lines. Past funding has not been sufficient to maintain facilities, resulting in facilities and utility systems deteriorating to the point that major contract repairs are required. FY 1992 real growth is required to arrest the deterioration of these national assets which are needed to support Congress' desire to "fly before buy."

Program Element: #0605894F
Title: Real Property Maintenance Activity (RPMA)

Budget Activity: 6-Defense-Wide Mission Support

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 8941, Operation of Utilities: Funds purchase of utilities (electricity, natural gas, water and sewage treatment), base operation of water and sewage treatment plants and distribution systems -- "must pay" bills for Edwards and Eglin AFBs - and related administration.

(U) FY 1990 Accomplishments:
- (U) Purchased utilities and operated utility plants and distribution system.

(U) FY 1991 Planned Program:
- (U) Purchase utilities and operate utility plants and distribution systems.
- (U) Increase funds ($1M) Edwards AFB tying into the city water system due to deterioration of well field and depletion of subterranean water sources.
- (U) Second year of 3-8% progressive electrical rate increase at Eglin AFB ($.7M). Guided Weapons Evaluation Facility (GWEF Test Chamber) coming on line Jun 91. Full effect will not be felt until FY92.

(U) FY 1992 Planned Program:
- (U) Continue purchase of utilities and operation of utility plants and distribution systems.
- (U) Final year of 3-8% progressive electrical rate increase at Eglin AFB ($1.2M). Full activation of GWEF test chamber ($2.0M).

(U) FY 1993 Planned Program:
- (U) Continue purchase of utilities and operation of utility plants and distribution systems.

(U) Work Performed By: In-house work force; Southern California Edision (SCE), CA; Pacific Gas and Electric Company, CA; Florida Power & Light, FL; and Gulf Power, FL.

(U) Related Activities:
(U) Program Element (PE) 0605807F, Test and Evaluation Support (TES), provides the mission funds for utilities at Arnold AFB since test mission support consumes almost all utility efforts. (U) There is no unnecessary duplicaton of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0605894F
Title: Real Property Maintenance Activity (RPMA)

Budget Activity: 6-Defense-Wide Mission Support

2. (U) Project 8942, Maintenance and Repair of Real Property: Project funds the maintenance and repair (M&R) of basic infrastructure and complex test facilities to slow deterioration; ensure preservation of Air Force facility investment; and related administration.

(U) FY 1990 Accomplishments:
- (U) Minimal dollar availability compounded by severe high wind/sand storm damage at Edwards AFB ($1.5M) and above normal amounts of precipitation at Eglin AFB ($.5M) resulted in inadequate M&R of RDT&E infrastructure and facilities and a growth in the M&R backlog to $80 million.

(U) FY 1991 Planned Program:
- (U) Funding for environmental projects transferred to a separate line item.
- (U) Congressional budget cuts in the FY91 RDT&E budget resulted in 23% of the dollars planned for M&R projects being spent on Category I, environmental compliance projects. Damage due to freezing weather at Edwards AFB, CA further cut into the FY91 planned program by $300K. Backlog increase is beginning to show effects of prior year underfunding and inflation and will climb to $88M.

(U) FY 1992 Planned Program:
- (U) Past underfunding in this line was recognized by the OSD analyst in PBD 370 and the requested FY 91 dollars were increased 10%. Funding below this level will allow backlogs to continue to grow and increase the frequency of major infrastructure failures, resulting in unreliable test data and necessitating costly retesting and program shutdown.

(U) FY 1993 Planned Program:
- (U) Decrease in funding ($44.0M) is a result of PBD 727 (Program Budget Decision) realigning M&R funds for RPMC and in-house projects over $15K to the military construction (MILCON) appropriations. Accomplishing M&R projects through the MILCON program will decrease the actual dollars spent for maintenance and repair of our infrastructure, because it cost 8-10% more to have projects designed/constructed by outside agencies.
- (U) In-house M&R projects will only be accomplished when there is a major infrastructure failure. Accomplishing emergency M&R projects (under $15K) will result in more costly repairs because of collateral damage done to facilities by the emergency situation; and delay vital weapon system testing.

Program Element: #0605894F
Title: Real Property Maintenance Activity (RPMA)

Budget Activity: 6-Defense-Wide Mission Support

- (U) Decrease will halt our initiative of extensive M&R in an effort to arrest accelerating deterioration of the infrastructure that provides the unique, complex, and dynamic environmental simulations required to support RDT&E efforts.
- (U) Backlog Maintenance And Repair (BMAR) will continue to climb at an unacceptable rate, further compounding the risk of extensive and expensive emergency repair work.

(U) Work Performed By: In-house work force; Conerly Construction, FL; and Lord & Son Construction, FL; SSI, PA; Sverdrup Inc, MI; Cal Span Corp, OH; Stevens Construction, CA; Foote Corp, CA.

(U) Related Activities:
(U) PE 0605807F, TES, provides the mission funds for civilian personnel at Arnold AFB since mission support consumes almost all personnel efforts.
(U) There is no unnecessary duplication of effort within the Air Force.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 8943, Minor Construction (MC): Project adapts facilities to current mission needs/standards through additions, alterations, replacements, relocations, and new facilities. The funded cost of each undertaking cannot exceed $200 thousand.

(U) FY 1990 Accomplishments:
- (U) Provided minimal MC support to RDT&E mission, leaving inadequate and antiquated facilities to accomplish research and testing.

(U) FY 1991 Planned Program:
- (U) Level of effort funding to provide minimum mission requirements.

(U) FY 1992 Planned Program:
- (U) Continuing level of effort to provide minimum mission requirements.

(U) FY 1993 Planned Program:
- (U) Zero funding as a result of PBD 727 (Program Budget Decision) which realigns MC funds to the military construction appropriation for projects between $15K and $200K.

Program Element: #0605894F
Title: Real Property Maintenance Activity (RPMA)

Budget Activity: 6-Defense-Wide Mission Support

(U) Work Performed By: In-house work force; Conerly Construction, FL; Lord & Son Construction, FL; SSI, PA; Sverdrup Inc, MI; Cal Span Corp, OH; Stevens Construction, CA; Foote Corp, CA.

(U) Related Activities:
(U) PE 0605807F, TES, provides the mission funds for civilian personnel at Arnold AFB since mission support consumes almost all personnel efforts.
(U) There is no unnecessary duplication of effort within the Air Force.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 8944, Other Support: Provides resources for Civil Engineering "must pay" services such as custodial, fire protection, refuse collection, entomology, rentals/leases, Architectural and Engineering (A&E) Design, grounds maintenance and related administration.

(U) FY 1990 Accomplishments:
- (U) Provided minimum health and safety services required to support bases' missions.

(U) FY 1991 Planned Program:
- (U) Continues minimum support services.

(U) FY 1992 Planned Program:
- (U) Continues minimum support services.

(U) FY 1993 Planned Program:
- (U) Continues minimum support services.

(U) Work Performed By: In-house work force; Cal Disposal, CA; Management Tech Svcs, CA; Computer Sciences Corporation, CA; Madison Svcs, MI; Environmental Waste, FL; General Physics Corp, MD.

(U) Related Activities:
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0605894F
Title: Real Property Maintenance Activity (RPMA)

Budget Activity: 6-Defense-Wide Mission Support

5. (U) Project 06EC, Environmental Compliance (EC): Project funds EC projects and resources for Civil Engineering "must pay" services to comply with environmental protection/compliance laws and regulations on environmental hazardous waste; hazardous waste disposal; underground storage tanks; air pollution; asbestos abatement and removal; other toxics; pollution sampling, studies, testing and inspection/repair of processing equipment; monetary assessments, fines and penalties; natural/cultural/historic/land management and related administration.

(U) FY 1990 Accomplishments:
- (U) Provided minimum dollars for EC projects classified as category I (i.e, facilities and equipment needed to comply with environmental deadlines which are past) and services required to allow compliance with stringent environmental regulatory criteria e.g, obtain hazardous waste storage permits and surveys; disposed of hazardous waste, asbestos mitigation and abatement, removal/replacement of underground storage tanks.

(U) FY 1991 Planned Program:
- (U) Provides minimal funding for EC category I requirements. Provided funds to resolve signed consent orders and currently out of compliance conditions e.g, hazardous waste disposal ($.6M); repair/replace pipelines and underground storage tanks ($2.8); conduct environmental compliance assessment program audits ($.2M).

(U) FY 1992 Planned Program:
- (U) Increase funding will support the findings of environmental audits conducted in previous years that identified numerous environmental compliance problems e.g., replacement of underground storage tanks and above ground fuel tanks ($2.0M), removal of hazardous and solid waste ($3.0M); repair of sewage treatment plants ($1.6M); groundwater clean up and monitoring ($1.7M) and maintaining level of effort to provide for civilian pay, supplies, service contracts ($3.9M) and appropriate inflation.
- (U) EC problems have resulted in Notice of Violaton (NOVs) at all three bases and the placement of Edwards AFB on the National Priorities List.
- (U) New environmental protection/compliance laws and regulatory criteria are constantly being enacted that place additional monetary requirements on our funding. Areas such as hazardous waste analyses and disposal; wastewater, air, noise pollution and asbestos abatement to include abatement studies, sampling, testing, permits/fees and removal; underground tank monitoring and leak testing repair and removal; Polychlorinated Biphenyls (PCBs) and other toxics; and environmental assessments have all experienced regulatory changes over the last two years.

Program Element: #0605894F
Title: Real Property Maintenance Activity (RPMA)

Budget Activity: 6-Defense-Wide Mission Support

(U) FY 1993 Planned Program:

- (U) Decrease in funding is a result of PBD 727 (Program Budget Decision) which realigned $44.0M to the military construction (MCP) appropriation. With these dollars now in the MCP account they are no longer ear-marked for RDT&E environmental problems, but can be used through out the Air Force for other then Environmental Compliance projects. RDT&E EC requirements consist of: hazardous and solid waste removal ($2.5M); groundwater clean-up and monitoring ($1.5M) and maintaining level-of-effort to provide for civilian pay, supplies, service contracts ($3.9M). The funding level, of $1.4M will allow minimal in-house EC efforts to be accomplished.
- (U) Decrease in funding will result in EC projects not being accomplished which will adversely effect a base's mission. Unresovled EC problems will result in fines and civil or criminal liabilities and possible base closures and additional Notices of Violations.

(U) Work Performed By: In-house work force; Cal Disposal, CA; Management Tech Svcs, CA; Computer Sciences Corporation, CA; Madison Svcs, MI; Environmental Waste, FL; General Physics Corp, MD.

(U) Related Activities:
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605896F
PE Title: Base Operation RDT&E

Budget Activity: #6 - Defense-Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
XXX1 Base Operating Support	66,036	61,722	76,306	82,104	Cont	TBD
Total	66,036	61,722	76,306	82,104	Cont	TBD

NOTE: This is one of the six AF RDT&E Test Infrastructure (PEs 0604755F, 0605708F, 0605807F, 0605863F, and 0605894F) accounts which provides direct support to the DOD test mission. Although there is significant growth from FY 91 to FY 92, it reflects programmatic adjustments and transfers. The aggregate FY 92 budget for these accounts still reflects a negative real growth in excess of 21 percent since 1968. During that time period, significant technology advancements have occurred without the investment in the test infrastructure to support the advanced test capability requirements.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides basic, essential services of base operating support at three Air Force Systems Command bases -- Eglin AFB FL, Edwards AFB CA, and Arnold AFB TN. The program funds bare minimum "open the doors" costs of day-to-day support for three Air Force Major Range and Test Facility Bases (MRTFBs) (Arnold Engineering and Development Center (AEDC), Air Force Flight Test Center (AFFTC), and Air Force Development Test Center(AFDTC)) with over 90 tenant organizations and an aggregate population in excess of 55,000. Civilian pay is approximately 48 percent of the total program, with the remainder of the program financing administrative support, security and guard services, dormitories, billeting, food services, training, transportation, and motor pools. Functions supported by this program element include comptroller, chaplain, personnel, supply, transportation, and information management. A concerted effort is being made to maintain these functions, however, the effects of inflation, coupled with having to absorb civilian pay raises and Department of Labor wage increases, has severely eroded the buying power of this account.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1990 Accomplishments:
- (U) Provided bare essential, base operating support (BOS) for three AFSC bases, thus allowing the complex and sophisticated test missions of these organizations to be accomplished.
- (U) Provided reduced contract manyears and quality-of-life services, based on prior year support, to these three AFSC bases.
- (U) Funded a civilian payroll totalling $27.2M.

(U) FY 1991 Planned Program:
- (U) Provide minimal base operating support for three AFSC bases, thus allowing the complex and sophisticated test missions of these organizations to be barely accomplished.

Program Element: #0605896F
PE Title: Base Operation RDT&E

Budget Activity: #6 - Defense-Wide Mission Support

- (U) With no changes planned to BOS functions and increased mission requirements, the budget reduction (programming error) coupled with the effect of inflation will result in reduced manning, vehicle fleet, training and quality-of-life services, and deferment of investment equipment--impacting mission readiness, productivity, morale of personnel and retention of highly skilled members.
- (U) Fund 916 civilian workyears with a payroll in excess of $30M.

(U) FY 1992 Planned Program:
- (U) Restores base operating support to three AFSC bases only to the FY 1990 level which will allow minimal testing required to meet Congress's desire to "fly before buy" ($1.3M civilian pay raise, $1.4M inflation, and $6.3M correction of FY 91 programming error).
- (U) Includes funding to support the management realignment of Air Force Development Test Center from a Product Division host (Munitions Systems Division - 3400 funded) to a RDT&E Test Center host ($4M civilian pay - 114 positions and $1.2M support costs) and civilianization of 22 non-military essential manpower positions (civilian pay $.4M) directed in Defense Management Review Decision (DMRD) 917.
- (U) Fund 1,040 civilian workyears with a payroll in excess of $36M.

(U) FY 1993 Planned Program:
- (U) Continues base operating support for three AFSC bases at the FY 1990 level which is required if the bases are to perform testing required to meet Congress's desire to "fly before buy" ($1.8M civilian pay and $1.8M inflation).
- (U) Includes funding for civilianization of an additional 40 non-military essential manpower positions ($1.1M civilian pay) directed in DMRD 917 and increased operational cost for the institution of the Defense Business Operation Fund ($1.4M) directed in DMRD 971.
- (U) Fund 1,069 civilian workyears with a payroll in excess of $38M.

(U) Work Performed By: AFFTC, AEDC, and AFDTC in-house work force and various service contractors. Major service contractors include General Services Administration; Litton Food Management Service, Wayne PA; Delta Patrol Services, Long Beach CA; and Kass Management Services Inc, Oakland CA.

(U) Related Activities:
- (U) PE #0605807F, Test and Evaluation, provides test mission operating funds to four AF RDT&E funded MRTFBs.
- (U) PE #0605894F, Real Property Maintenance Activity, provides civil engineering activities to include facility projects for three AFSC R&D managed and supported bases.
- (U) There is no duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0701112F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: Inventory Control Point Operations

A. (U) RESOURCES ($ in Thousands):

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3090 Embedded Computer Resources Support Improvement Program (ESIP)	4,584*	4,837*	0**	0**	0**	**
XXX1 Class IV Multiapplication Modifications	0	0	2,967	5,196	8,878	17,041
Total	4,584	4,837	2,967	5,196	8,878	**

* Funds are controlled and managed under ESIP in conjunction with PE 0708012F and are referenced in that PE's Descriptive Summary as well.

** All ESIP FY 1992 and beyond funding has been transferred to PE 0708012F and is reported in that PE's Descriptive Summary.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program funds the growing need for research and development of support issues related to the increasing reliance on computer resources. Research of support issues is required since support generates 70 percent of life cycle costs. New software design techniques; software support tools, environments, and processes; and standards for digital documentation will result from this program. This program also supports development of an Air Force organic depot support capability for the Air Force's Standard Precision and Medium Accuracy Inertial Navigation Units (INU). INU depot support must be established prior to expiration of existing contractor maintenance warranties to avoid requirements for costly and undesirable contractor logistics support.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 3090, Embedded Computer Resources Support Improvement Program (ESIP):
Conducts research to improve support of embedded computer system software. It encompasses automation and standardization of support processes, advanced support environments, and readiness support. ESIP leverages developments in software technology to make support more responsive and efficient. Project transferred to PE 0708012F, Logistic Support Activities, beginning in FY 1992.

Program Element: #0701112F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: Inventory Control Point Operations

(U) FY 1990 Accomplishments:
- (U) Evaluated radar rapid turnaround study for follow-on efforts.
- (U) Assessed modular embedded computer systems (MECS) development practices and tools for use in an advanced support environment (ASE).
- (U) Completed Phase I of fault tolerant Ada software effort.
- (U) Initiated software instrumentation.
- (U) Demonstrated set-up capabilities for an operational flight program automated validation (AUTOVAL) effort.
- (U) Transitioned emergency reprogramming center automated status system to Warner Robins Air Logistic Center (ALC).
- (U) Transitioned realtime network, simulation set, low cost cockpit displays for F-16A/B to Ogden ALC.
- (U) Initiated multiple avionics processor monitor capability.
- (U) Started software documentation traces effort.
- (U) Transitioned low cost cockpit displays to Warner Robins ALC for Special Operations Forces applications.

(U) FY 1991 Planned Program:
- (U) Develop fault tolerant and distributed software techniques.
- (U) Demonstrate test suite execution.
- (U) Integrated communication/navigation/identification database into integrated electromagnetic system simulator.
- (U) Integrate results from MECS study into ASE.
- (U) Complete phase I for OFP AUTOVAL effort.
- (U) Award AUTOVAL phase II for automated test case generation.
- (U) Complete phase I for MAPM tool.
- (U) Start development in high payoff areas from MECS study.
- (U) Integrate/evaluate software documentation tracing program.
- (U) Initiate data reduction/analysis visualization effort.
- (U) Explore emulator state-of-the-art.

(U) FY 1992 Planned Program: Not Applicable. Effort moved to PE #0708012F.

(U) FY 1993 Planned Program: Not Applicable. Effort moved to PE #0708012F.

(U) Work Performed By: In-house work is done by Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are ITT, Fort Wayne IN; TRW, Dayton OH; The Analytical Sciences Corporation, Reading MA; Westinghouse, Baltimore MD; and SBS, Houston TX. Draper Laab, Cambridge MA; and Science Applications International Corporation, Panama City FL

(U) Related Activities:
- (U) PE #0708012F, Logistic Support Activity.
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

Program Element: #0701112F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: Inventory Control Point Operations

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project XXX1, Class IV Multiapplication Modifications: Develops depot support equipment (SE) for the Standard Precision Accuracy (SPA) Inertial Navigation Unit (INU) and for the medium accuracy Standard & F-15 Ring Laser Gyro (RLG) INUs. (Supplements INU depot SE development in PE 64201F, Project 2258, Standard Inertial Navigation Unit.) Without this additional funding, development of INU depot SE will be delayed at least two years beyond the end of INU maintenance warranties and require costly interim contractor logistics support at approximately $6-8M per year. (SE funding has been deferred previously due to funding cuts. These prior year cuts required a "backward" ramp in the funding profile.)

(U) FY 1990 Accomplishments: Not Applicable.

(U) FY 1991 Planned Program: Not Applicable.

(U) FY 1992 Planned Program:
- (U) Continue development of INU maintenance, test and calibration hardware and test program set software.

(U) FY 1993 Planned Program:
- (U) Continue development of INU maintenance, test and calibration hardware and test program set software.

(U) Work Performed By: Contractor has not yet been identified. The Aeronautical Equipment System Program Office, Aeronautical Systems Division (Air Force Systems Command), Wright-Patterson AFB OH, provides program management.

(U) Related Activities:
- (U) PE 0604201F, Aircraft Avionics Equipment Development
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0702207F Budget Activity: 6 - Defense-Wide Mission Support
PE Title: Depot Maintenance

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY90 Actual	FY91 Estimate	FY92 Estimate	FY93 Estimate	To Complete	Total Program
3326, Precision Measurement & Calibration Equipment Development (PMCED)						
	2409	2715	2959	3238	Cont	TBD
TOTAL	2409	2715	2959	3238	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: Program develops, tests, & evaluates measurement standards & associated equipment for 180 base precision measurement equipment laboratories (PMELs) world-wide. The technology of modern weapons systems requires research & development of calibration to support the Air Force mission.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN BOTH FY 1992 AND FY 1993:

(U) Project: 3326, PMCED. Designed to develop, test, & evaluate standards & associated equipment used in the measurement & calibration of advanced weapons systems & support equipment to include such high technology as lasers, microwave, millimeter wave, electro-optical, & automatic test equipment.

(U) FY 1990 Accomplishments:
- Initiated work on near field MILSTAR antenna calibration capability.
- Continued work on microwave measurements to support radar and communication systems.
- Developed bolometer to support LASER range finder/receiver metrology
- Developed long wave length standards for Infrared detection systems.
- Initiated development of multimode standards for fiber optic systems.

(U) FY 1991 Planned Program:
- Continue development of fiber optic standards and MILSTAR antenna calibration capability.
- Improve standards of resistance, pressure, temperature, microwave power, and magnetics for guidance, air data, communications, and radar systems support.
- Develop electro-optical/microwave standards for AF detection/ targeting systems.

(U) FY 1992 Planned Program:
- Validate near field MILSTAR antenna calibration capability
- Initiate studies to develop more efficient Automatic Test Equipment calibration strategies and high power LASER calibration capability for weapon class LASERs.

Program Element: #0702207F Budget Activity: #6 Defense-Wide Mission Support
PE Title: Depot Maintenance

- Proceed with lab/field studies to improve basic standards for requirements for AF systems as defined by the Joint Metrology RDT&E program and the advisory assistance of the National Institute of Standards and Technology (NIST).

(U) FY 1993 Planned Program:
- Continue design of LASER, Infrared, microwave and millimeterwave standards and calibration capability for developing weapons systems
- Continue to improve base references and improve standards to increase measurement reliability and reduce costs of operational support as identified by the Joint Service Metrology plan and the NIST. NIST.

D. (U) Work Performed By: Sixty percent of the work is performed by NIST, with 25% and 5 % being performed by private industry, universities/non-institutions and Air Force Primary Standards Laboratory, respectively.

E. (U) Related Activities:
- Program Element #072207F, (Depot Maintenance)
- Work is primarily NIST and Engineering Working Groups of the Calibration Coordination Group of the Joint Technical Coordinating Group for Metrology and Calibration.

(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

F. (U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0708011F
Title: Industrial Preparedness

Project Number: 2865
Budget Activity: #6 - Defense Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Title - Manufacturing Technology

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
MANTECH	85,000	109,236	50,535	79,163	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
MANTECH is the RDT&E part of a larger Air Force industrial base program that includes many activities that impact industrial preparedness and productivity; key elements in force readiness, modernization and sustainability. MANTECH is the only concentrated manufacturing R&D done by the Air Force. It develops manufacturing processes that determine what products can be produced and at what cost. History shows that manufacturing process technology often precedes advances in product technology or performance. MANTECH transitions advanced product designs into producible, high quality, cost-effective weapon systems and components. MANTECH is critical in maintaining a strong defense industrial base and in solving manufacturing challenges that influence domestic manufacturing competitiveness.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments
   - (U) Complete activity on holographic inspection of wafers.
   - (U) Initiate activities to significantly reduce the cost of manufacturing conventional composite structures.
   - (U) Complete work on fabrication and inspection of very high speed integrated circuit printed wiring boards.
   - (U) Initiate manufacturing science programs in carbon/carbon materials, three dimensional modeling for castings, and electronic packaging.
   - (U) Complete effort on machining initiative for aerospace contractors and support to National Center for Manufacturing Sciences.
   - (U) Initiate work on high voltage power supplies.
   - (U) Focus on producibility and yield increases of new electronic systems using focal plane arrays, radiation hardened circuits and solar cells.
   - (U) Tailor latest metal cutting, cutting tools, machining data and systems technology to meet manufacturing subcontractors needs.
   - (U) Continue on-going projects.

Program Element: # 0708011F
PE Title: Industrial Preparedness

Project Number: 2865
Budget Activity: Defense Wide Mission Support

2. (U) FY 1991 Planned Program:
   - (U) Initiate efforts on Alpha 2 metal matrix composites.
   - (U) Initiate efforts on expitaxial growth of semiconductor and optical materials.
   - (U) Complete activity focused on composite manufacture for small engines.
   - (U) Initiate activities to establish paint removal techniques for large aircraft for the Air Logistics Centers.
   - (U) Continue program to scale up advanced propellant binder materials.
   - (U) Initiate work on carbon/carbon for expendable engines.
   - (U) Complete activities focused on information integration applied to airframe assembly.
   - (U) Complete efforts on assembly techniques for tactical missile sensors.
   - (U) Continue on-going projects.

3. (U) FY 1992 Planned Program:
   - (U) Terminate all machine tool activities.
   - (U) Defer efforts in high temperature materials and in microelectronics manufacturing systems (MMST).
   - (U) Descope work in low cost composite manufacturing, electronics manufacturing and producibility (EMPI) and information integration.
   - (U) Continue systems driven programs and programs to support and insert advanced technology into Air Logistic Centers.

4. (U) FY 1993 Planned Program:
   - (U) Complete effort on composite advanced tooling.
   - (U) Complete work on Solder/Desolder program.
   - (U) Initiate work in high temperature materials.
   - (U) Complete High Voltage Power Supply program.
   - (U) Continue on-going projects.

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

D. (U) Work Performed By: MANTECH is executed by the Wright Research & Development Center, Wright-Patterson AFB, Ohio, Manufacturing Technology Directorate. Actual work, however, is competitively contracted for with private industry or universities. The top five contractors are Texas Instruments, Dallas, TX; Martin Marietta, Denver, CO; Northrop Corporation, Hawthorne, CA; Dravo Automation Sciences, Inc., Pittsburgh, PA; and United Technologies Corporation, West Palm Beach, FL.

Program Element: # 0708011F
PE Title: Industrial Preparedness
Project Number: 2865
Budget Activity: Defense Wide Mission Support

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:
- (U) DOD Instruction 4200.15, Manufacturing Technology, 5/85
- (U) Defense Planning Guidance 92-97

G. (U) RELATED ACTIVITIES:
- (U) The Army, Navy, and Defense Logistics Agency have PE 0708011 MANTECH programs that are coordinated with this program.
- (U) Other government agencies like NASA, the Defense Advanced Research Projects Agency, the Strategic Defense Initiative, and the National Institute of Standards & Technology pursue manufacturing technology development.
- (U) Individual weapon system program managers do manufacturing research specifically related to their weapon systems.
- (U) Manufacturing technology efforts are coordinated through the DOD MANTECH Advisory Group that includes industry representatives.
- (U) The Manufacturing Technology Directorate at Wright-Patterson AFB is the Air Force's single focal point for all manufacturing technology activity.
- (U) The Air Force does other industrial preparedness and productivity enhancing activity such as Industrial Base Planning, the Industrial Modernization Incentives Program (IMIP), and the operating of twelve government-owned, contractor-operated industrial plants. These are funded with procurement appropriations.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands): Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE: Not Applicable. Project dedicated to manufacturing process, methods, and equipment development in support of generic weapon system manufacturing needs.

FY91 FINANCIAL PLAN
FY1992/FY1993 BUDGET ESTIMATE SUBMISSION
MANUFACTURING TECHNOLOGY
TITLE: INDUSTRIAL PREPAREDNESS

DoD Mission Area:480 - Production Base Support
Budget Activity: 6 Defense Wide Mission Support

Procurement Appropriation Support Project (Title) ID (End Items Supported) Thrust Number	FY1990 Actual	FY1991 Est	FY1992 Est	FY1993 Est	Additional to Complete	Tot Est Cost
AIRCRAFT PROCUREMENT, AIR FORCE						
A0005 Manufacturing Methods for Thermoplastics ATF, F-16, F-15, Future Systems - 1	2500	1500	750	0	0	11050
A0268 MT for Ad Tooling Concepts Future Systems - 1	1300	2300	2300	1915	0	7815
A4047 Manufacture of Thermo-plastic Spares F-16, F-15, ATF, Future Systems - 1	0	250	650	100	0	1000
A0378 Low Cost Composites Mfg Future Systems - 1	0	2995	3475	8000	19525	33995
A3095 Laser Consolidation of Thermoplastics ATF, Future Systems - 1	200	300	0	0	0	500
A0408 Composite Manufacturing Cost Handbook All Future Systems - 1	0	0	0	500	510	1010
A0008 MT for Adv. Propulsion and Materials and Adv Fighter A0185 Engine Future Systems - 3	7080	3742	565	0	0	61994
A0418 Advanced Metal Matrix Foil Manufacturing Engines, Future Aircraft - 3	0	250	0	1000	1450	2770
A0273 Premium Quality Ti Alloy Advanced Engines - 3	1200	800	1200	297	0	4196

Program Element: 0708011F
DoD Mission Area: 480 - Production Base Support
Budget Activity: 6 Defense Wide Mission Suppor

Procurement Appropriation Support Project (Title) ID (End Items Supported) Thrust Number	FY1990 Actual	FY1991 Est	FY1992 Est	FY1993 Est	Additional to Complete	Total Est Cost
AIRCRAFT PROCUREMENT, AIR FORCE						
A0410 High Speed Airfoil Machining ATF, Advanced Engines - 3	0	100	0	1200	1550	2850
A0380 Producible Nozzle Structure Manufacturing ATF, Advanced Engines - 3	0	0	0	1500	3750	5250
A0372 MT for Transmit/Receive Modules ATF Radar, Future Systems, Satellites - 4	3956	3370	2990	3070	0	15120
A0181 Automated Airframe Assy ATF, Future Systems - 6	3790	678	0	0	0	20583
A0301 Enterprise Integration All Systems - 6	20	2000	2000	2400	14580	21000
Total Aircraft Procurement, Air Force, Related						
Overall Total		18285	13930	19982		

Program Element: 0708011F
DoD Mission Area: 480 - Production Base Support
Budget Activity: 6 Defense Wide Mission Support

Procurement Appropriation Support Project (Title) ID (End Items Supported) Number	FY1990 Actual	FY1991 Est	FY1992 Est	FY1993 Est	Additional to Complete	Total Est Cost Th
MISSILE PROCUREMENT, AIR FORCE						
A0303 Adv Binder Materials Future Tactical Strategic Missiles - 7	900	1200	900	141	0	3141
A0300 Small Engine Compressor Rotors Missile Engines - 7	500	1063	0	0	0	3008
A0406 Carbon/Carbon Expendable Engine Missile Engines - 7	0	50	1200	1200	800	3250
A0405 Producible Missile Structures Advance Missiles - 7	0	800	1000	0	0	1800
A0409 Monolithic Titanium Aluminide Structures Missile Engines - 7	0	125	0	375	700	1200
A0032 MT for HgCdTe Focal Plane Arrays BSTS. Tactical; Systems - 8	2001	1532	0	0	0	10699
A0221 MT for Radiation Hardened SOI Wafers DSCS, MILSTAR, Advanced Satellites - 8	1109	1800	2035	1656	0	6991
A0275 MT for Rugged, Thin GaAs Solar Cells Advanced Satellites - 8	500	388	0	0	0	1938
A0319 Electronics Producibility - IR Sensor SFW, Adv. Munitions - 9	1000	200	0	0	0	2500
A0411 Adv RamJet Structures Manufacturing Advanced Missile Engines - 9	0	50	800	1200	750	2800
A0399 Durable Coatings for IR Window Advanced Maverick - 9	100	300	0	0	0	400

Program Element: 0708011F
DoD Mission Area: 480 - Production Base Support

Budget Activity: 6 Defense Wide Mission Support

Procurement Appriation Support Project (Title) ID (End Items Supported)	FY1990 Actual	FY1991 Est	FY1992 Est	FY1993 Est	Additional to Complete	Total Est Cost
MISSILE PROCUREMENT, AIR FORCE						
A0412 Active Matrix Liquid Crystal Displays Advanced Cockpits - Missile Interface - 9	0	0	0	1500	3500	5000
Total Missile Procurement, Air Force, Related						
Overall Total		7508	5935	6072		

Program Element: 0708011F
DoD Mission Area: 480 - Production Base Support
Budget Activity: 6 Defense Wide Mission Support

Procurement Appropriation Support Project (Title) ID (End Items Supported) Number	FY1990 Actual	FY1991 Est	FY1992 Est	FY1993 EST	Additional to Complete	Total Est Cost	Th
O&M, AIR FORCE							
A0187 Static & Accessory Repair Engine Repair - 5	1100	670	146	0	0	7509	
A0226 Oklahoma City ALC Flexible Repair Center Engine Case Repair - 5	2100	2100	866	0	0	13704	
A0255 Robotic Applications/ Shot Peen Engine Repair - 5	1250	1000	138	0	0	2408	
A0276 SPARES (CALS) Spares Acquisition - 5	668	2000	2600	2600	900	8768	
A0224 Large Aircraft Paint Stripping Aircraft Repair - 5	0	1000	1425	1800	1900	6125	
A0366 Blade Repair Engine Repair - 5	0	348	1370	1800	0	3443	
A0367 Solder/Desolder Electronics Repair - 5	0	100	700	600	0	1400	
A0382 Solder Inspection Electronics Repair - 5	0	100	480	600	0	1180	
A0318 Robotic Deseal Airframe Repairs - 5	1150	50	0	0	0	2700	
A0381 Composite Engine Repair Engine Repair - 5	0	0	0	1100	1425	2525	
A0013 Blades/Disk Disassembly Engine Repair - 5	518	232	0	0	0	3123	
A0397 Solder Center Electronics Repair - 5	100	300	300	300	0	1000	
Total O&M, Air Force, Related		7900	8025	8800			

Program Element: 0708011F
DoD Mission Area: 480 - Production Base Support
Budget Activity: 6 Defense Wide Mission Suppo

Procurement Appropriation Supported Project (Title) ID (End Items Supported) Thrust Number	FY1990 Actual	FY1991 Est	FY1992 Est	FY1993 Est	Additional to Complete	Total Est Cost
GENERIC PROCUREMENT						
A0398 Electronics Manufacturing Process Improvement (I & II) All Systems - 4	314	2310	635	1200	1635	6459
A0413 Sensor Based Manufacturing All Systems - 4	0	0	0	738	300	
A0320 Electronics Producibility - All Systems - 4	600	1300	1231	1536	0	4667
A0295 Microelectronics Mfg Science, Technology & Equipment All Systems - 4	5000	5800	0	9000	8200	34000
A0339 Next Generation Controller All Systems - 6	5050	5175	0	4008	5200	19683
A0414 Manufacturing Technology Special Advanced Studies All Systems - 6	0	0	0	4000	44000	48000
A0026 Manufacturing Technology Special Studies All Systems - 6	7826	9511	8214	4434	15548	45533
A0415 Rapid Prototype Development All Systems - 6	0	200	500	700	0	1200
A0416 Technology Cost & Risk All Systems - 6	0	100	200	0	0	300
A0308 Machine Tool Initiative All Systems - 6	1444	457	75	0	0	3167
A0417 Machine Tool Sensor Improvement (II, III) All Systems - 6	10	944	0	2750	2400	6104
A0374 Integration Validation Environment All Systems - 6	0	0	0	300	800	1100
A0419 Application Validation Ctr All Systems - 6	0	0	0	500	1250	1750

Procurement Appropriation Supported Project (Title) ID (End Items Supported) Thrust Number	FY1990 Actual	FY1991 Est	FY1992 Est	FY1993 Est	Additional to Complete	Total Est Cost
GENERIC PROCUREMENT, AIR FORCE						
A0369 Integrated Tool Kit & Methods All Systems - 6	30	1000	1000	440	560	3030
A0370 PDES Application (Composites) All Systems - 6	30	1000	1250	1250	1750	5280
A0400 PDES Applications (Electronics) All Systems - 6	0	312	0	1100	2990	4402
A0420 Integrated Process Applications Manager All Systems - 6	0	0	0	500	3700	4200
A0260 E10 Framework Support All Systems - 6	210	210	210	210	210	1050
A0421 Performance - Measurement for Integration Technology All Systems - 6	0	0	0	300	1690	1990
Total Generic Procurement, Air Force, Related						
Overall Total		28319	13315	32866		

Program Element: 0708011F
DoD Mission Area: 480 - Production Base Support
Budget Activity: 6 Defense Wide Mission Support

Procurement Appropriation Supported Project (Title) ID (End Items Supported) Thrust Number	FY1990 Actual	FY1991 Est	FY1992 Est	FY1993 EST	Additional to Complete	Total Est Cost
R&D, AIR FORCE						
A0423 Alpha-2 Metal Matrix Generic Applicability - 10	0	10	0	2000	2700	4710 Co
A0392 HBC Initiative: CIM Protocol and Logistics Generic Applicability - 10	102	104	101	101	0	408
A0183 Complex Shaped Thermoplastic Generic Applicability - 10	300	85	0	0	0	722
A0191 Rugate Filters Generic Applicability - 10	420	72	0	0	0	2352
A0263 Automated Airframe Assembly Generic Applicability - 10	1550	634	0	0	0	4650
A0304 Knowledge Integrated Design System Generic Applicability - 10	1000	1400	1300	600	398	4698
A0305 Manufacturing Science for Carbon-Carbon Generic Applicability - 10	329	1300	1300	1200	671	4800
A0306 Adv Composite Processing Generic Applicability - 10	675	265	0	0	0	1740
A0386 HBC Initiative: Feature Recognition for Product Definition Generic Applicability - 10	32	131	137	36	0	336
A0328 Reliability without Hermeticity Generic Applicability - 10	11	1000	1500	1500	940	4951
A0372 Concurrent Engineering for Adv Nozzle Generic Applicability - 10	10	700	750	40	0	1500

Program Element: 0708011F
DoD Mission Area: 480 - Production Base Support
Budget Activity: 6 Defense Wide Mission Support

Procurement Appropriation Supported Project (Title) ID (End Items Supported) Thrust Number	FY1990 Actual	FY1991 Est	FY1992 Est	FY1993 Est	Additional to Complete	Total Est Cost
R&D AIR FORCE						
A0422 Sensors and Control for Expitaxial Growth Generic Applicability - 10	0	350	350	400	400	1500
AXXXX Ordered Polymer Film Generic Applicability - 10	0	0	0	1100	2400	3500
Total R&D, Air Force, Related						
Overall Total		6051	5438	6977		

Program Element: 0708011F
DoD Mission Area: 480 - Production Base Support
Budget Activity: 6 Defense Wide Mission Support

Procurement Appropriation Supported Project (Title) ID (End Items Supported) Thrust Number	FY1990 Actual	FY1991 Est	FY1992 Est	FY1993 Est	Additional to Complete	Total Est Cost
DIRECTED PROGRAM						
Program Support	3975	4145	4300	4300	N/A	N/A
Total, Directed Program		72,133	50,943	79,097		

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0708012F
PE Title: Logistic Support Activities
Budget Activity: #6-Defense-Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
3090 Embedded Computer Resources Support Improvement Program (ESIP)						
	4,584*	4,837*	4,996	5,223	Cont	TBD
3317 Air Force Digital Specifications and Standards						
	0	0	1,618	1,372	5,411	8,401
TOTAL	4,584*	4,837*	6,614	6,595	Cont	TBD

* Funding in FY 1990 and FY 1991 for ESIP is in PE 0701112F.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program funds the growing need for research and development of support issues related to the increasing reliance on computer resources. Research of support issues is required since support generates 70 per cent of life cycle costs. New software design techniques; software support tools, environments, and processes; and standards for digital documentation will result from this program.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project 3090, Embedded Computer Resources Support Improvement Program: This project conducts research to improve support of embedded computer system software. It encompasses automation and standardization of support processes, advanced support environments, and readiness support. ESIP leverages developments in software technology to make support more responsive and efficient. This project is transferred from PE 0701112F, Inventory Control Point Operations, starting FY 1992.

(U) FY 1990 Accomplishments:
- (U) Evaluated radar rapid turnaround study for follow-on efforts.
- (U) Assessed modular embedded computer systems development practices and tools for use in an advanced support environment.
- (U) Completed Phase I of fault tolerant Ada software effort.
- (U) Initiated software instrumentation study.
- (U) Demonstrated set-up capabilities for an operational flight program automated validation effort.
- (U) Transitioned emergency reprogramming center automated status system to Warner Robins Air Logistics Center (ALC).
- (U) Transitioned realtime network, simulation set, low cost cockpit displays for F-16 A/B to Ogden ALC.
- (U) Initiated multiple avionics processor monitor capability.
- (U) Started software documentation traces effort.
- (U) Transitioned low cost cockpit displays to Warner Robins ALC for Special Operations Forces applications.

(U) FY 1991 Planned Program:
- (U) Develop fault tolerant and distributed software techniques.
- (U) Demonstrate test suite execution.

Program Element: #0708012F Budget Activity: #6-Defense-Wide
PE Title: Logistic Support Activities Mission Support

- (U) Integrate communication/navigation/identification database into integrated electromagnetic system simulator.
- (U) Integrate results from modular embedded computer software (MECS) study into advanced support environment (ASE).
- (U) Complete phase I for operational flight program automated validation (AUTOVAL) effort.
- (U) Award phase II of AUTOVAL for automated test case generation.
- (U) Complete phase I for multiple avionics processor monitor tool.
- (U) Start development in high payoff areas from MECS study.
- (U) Integrate and evaluate software documentation tracing program.
- (U) Initiate data reduction/analysis visualization effort.
- (U) Explore emulator state-of-the-art.

(U) FY 1992 Planned Program:
- (U) Define automated test generation from requirements.
- (U) Pursue application of AUTOVAL to other weapon systems.
- (U) Demonstrate applicability of data visualization techniques to problem identification and analysis.
- (U) Initiate smart controller for software instrumentation.
- (U) Explore radio frequency simulation data streaming techniques.
- (U) Initiate modular embedded computer software techniques of partitioning and optimization scheduling.
- (U) Define emulators and stimulators for ASE.

(U) FY 1993 Planned Program:
- (U) Demonstrate applicability of hypermedia technology to the automation and cross-referencing of software documentation.
- (U) Integrate Ada support tools into ASE.
- (U) Demonstrate automatic test generation techniques in an ASE.
- (U) Explore object oriented database technology to address vast documentation/traceability/interface issues.
- (U) Initiate adaptation techniques for rapid turnaround.
- (U) Explore security identification techniques for viruses.
- (U) Assess virtual simulator concept.
- (U) Pursue hardware simulators for test environment.
- (U) Assess data requirements for smart software instrumentation.
- (U) Demonstrate fault tolerant techniques.
- (U) Initiate techniques for parallel processing and artificial intelligence support.

(U) Work Performed By: In-house work is done by Wright Laboratory, Wright-Patterson AFB, OH. The contractors are ITT, Fort Wayne, IN; TRW, Dayton, OH; The Analytical Sciences Corporation, Reading, MA; Westinghouse, Baltimore, MD; SBS, Houston, TX; Draper Lab, Cambridge, MA; and Science Applications International Corporation, Panama City, FL.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0708012F Budget Activity: #6-Defense-Wide Mission Support
PE Title: Logistic Support Activities

2. (U) Project 3317, Air Force Digital Specifications and Standards: This project conducts research leading to the development and updating of digital standards. These standards are required to implement the computer-aided acquisition and logistics support (CALS) concept to use digital data in an integrated data base format instead of paper and/or a combination of stand-alone computing systems. This also funds the Air Force Digital Standards Office which will have Air Force management and Air Force technical preparation responsibility for the standards to be developed and will have to coordinate with corresponding offices in the Army and Navy.

(U) FY 1990 Accomplishments:
- (U) Initiated in-house planning.

(U) FY 1991 Planned Program:
- (U) Develop operating concept, staffing plan, and strategic and management plans.
- (U) Develop transition plan for accepting CALS digital standards from National Institute of Standards and Technology (NIST).
- (U) Develop an interactive desktop digital standards distribution system for use with government and industry personal computers.
- (U) Develop and implement standards validation network.
- (U) Review Improved Technical Data System (ITDS) authoring and publishing systems and develop MIL-M-28001A changes for B-2.

(U) FY 1992 Planned Program:
- (U) Develop and publish the Formatting Output Specification Instance (FOSI) for MIL-B-38784C.
- (U) Develop data base for publication of digital standards.
- (U) Develop and publish MIL-M-28001A handbook, MIL-M-28001B, MIL-M-28000A, MIL-R-28002A, and MIL-STD-1840C.
- (U) Review preliminary development work on Content Data Model, and develop and publish the Interactive Technical Data standard.
- (U) Develop and publish standards for digital data acceptance and quality assurance, Contractor Integrated Technical Information Services (CITIS), and digital data security.

(U) FY 1993 Planned Program:
- (U) Continue preparation and initiate publication of new standards.
- (U) Continue updating digital standards.

(U) Work Performed By: Work Performed By: In-house work is done by the Digital Standards Office, Logistics Management Systems Center, Air Force Logistics Command, Wright-Patterson AFB, OH. Contractor support is to be determined.

(U) Related Activities: There is no unnecessary duplication of effort within the Air Force or Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0708026F
PE Title: Productivity, Reliability, Availability, Maintainability (PRAM)
Project Number: N/A
Budget Activity: #6-Defense Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Title PRAM

Popular Name	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
PRAM	19,458	20,006	24,364	25,616	Cont	TBD

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
PRAM was formed in 1975 by the AF Chief of Staff to reduce current and potential operations and support costs and to improve the effectiveness of Air Force operational systems, subsystems, and equipment by facilitating the adaptation and implementation of off-the-shelf technology in keeping with the tenets of the USAf R&M 2000 program. PRAM has 118 active projects with returns-on-investment averaging 16:1.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1990 Accomplishments:
   - (U) Field tested a new high reliability, maintenance-free battery on USAF ground support equipment. Solves one of the DOD's most severe support problems. A follow-on to the successful C-130 and F-4 aircraft battery project which saw implementation of this technology into those weapon systems during 1990.
   - (U) Achieved initial operating capability on the stationary neutron radiography nondestructive inspection system. This system is now providing DOD the capability of detecting early corrosion for large aircraft sections on the F-111 with targeted application to the Advanced Tactical Fighter.
   - (U) Completed the F-16 War Reserve Material 370-gallon fuel tank project. Resulted in the reduction of assembly time from an unacceptable 26 man-hours to less than 11 man-hours. The technical orders are now being changed to allow not only faster assembly time by unskilled personnel, but eliminates a critical fuel leak problem too.

2. (U) FY 1991 Planned Program:
   - (U) Complete the design and begin the installation of the E-3A Klystron Power Amplifier Hot Mock-Up to improve the R&M on the unit and reduce the "burn-in" time when installed on the aircraft. Will result in 32 more E-3A sorties per year and provide Tinker AFB with an intermediate-level capability for approximately 67% of the E-3A's electrical problems.
   - (U) Other projects accomplished in addition to these representative projects.

Program Element: #0708026F
PE Title: Productivity, Reliability, Availability, Maintainability (PRAM)
Project Number: N/A
Budget Activity: #6-Defense Wide Mission Support

- (U) Begin the redesign and prototyping of a hand-held laser communicator (radio) for the special operating forces. Current rendezvous and aerial refueling techniques can be greatly improved by this "comm-out" approach. Delivery is anticipated in late 1991.
- (U) Begin application of superplastically formed/adhesively bonded techniques using aluminum composite technology for improving the R&M of the F-15 stabilator leading and trailing edges. This form, fit and function replacement of the troublesome aluminum honeycomb structures promises a life cycle cost avoidance in excess of $ 20 million and with little or no weight penalty.

3. (U) FY 1992 Planned Program:
   - (U) Replace the B-52 cartridge starter wheel assembly with a ceramic turbine wheel. This technology upgrade in ceramics will reduce production costs by 66% and weight by 15%. Successful prototyping will be applicable to all cartridge starters and possibly air cycle machines.
   - (U) Design and build an Aircraft Battle Damage Repair Simulator to greatly enhance training of Combat Logistics Support Squadrons in repair of weight-saving materials in current and future USAF weapon systems.
   - (U) Qualify a new corrosion resistant, high temperature aluminum alloy for the F-15C/D main wheel. This new rapid solidification technology wheel will double time between maintenance intervals due to higher temperature strength and corrosion resistance. Will become the "USAF wheel" with wide application to next generation aircraft.
   - (U) C-5 Hydraulic System Pressure Surge Reduction Device eliminates hydraulic leaks/failures due to presssure spike fatigue or impact damage using surge vent valve technology to prevent pressure system anamolies. Will significantly improve our heavy airlift fleet readiness and availability rates.

4. (U) FY 1993 Planned Program:
   - (U) Prototype, flight test and qualify a new digital solid state altimeter on the A-10 aircraft. This form, fit and function upgrade will improve R&M and ownerships costs and will become the new USAF standard for all applicable weapon systems.
   - (U) Develop a repair procedure for the graphite polyimide external augmentor flap on the F-100-PW-220, and -229 engines. This composite repair technology advance will greatly enhance the USAF defect analysis and engine repair capability. Upgrade will vastly enhance R&M and reduce ownership costs.
   - (U) Rome Air Development Center will complete initial prototyping, developmental testing and evaluation of a enhanced B-52 Infrared Camera. This forward looking infrared technology promises greater R&M and mission performance.

Program Element: #0708026F
PE Title: Productivity, Reliability, Availability, Maintainability (PRAM)
Project Number: N/A
Budget Activity: #6-Defense Wide Mission Support

- (U) AGM-65 R&M Improvement will develop alternative technological solutions to replace the missile's critical components which are reaching or exceeding their designed shelf life for which severely diminished manufacturing/supply sources remain.

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

D. (U) WORK PERFORMED BY: The PRAM Program Office is located at Wright-Patterson AFB, OH. Satellite PRAM offices with full time PRAM field managers are located at each of the five AF Logistics Centers, the Aerospace Guidance and Metrology Center, Newark OH; and at SAC, MAC, TAC, and ATC. PRAM liaison personnel are also located at each of the other major air commands. The AF Wright Research and Development Center and AF Systems Command product divisions and test activities also participate in the PRAM Program. The largest participating contractors are General Dynamics, Dallas-Ft. Worth, TX; Westinghouse Corp., Baltimore, MD; McDonnell-Douglas, St. Louis, MO; and Lockheed Aircraft Systems, Marietta, GA.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: None
3. (U) COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION: Not Applicable

G. (U) RELATED ACTIVITIES:
   (U) Reliability & Maintainability Technology Insertion Program, (PE 0604609F)
   (U) All PRAM projects are closely coordinated with the AF laboratories to preclude duplication of effort and to take advantage of technology advances emanating from the laboratory environment.
   (U) All PRAM projects are reviewed for potential Army/Navy interest, and dialogue is established in cases where commonality of problems exist such that solutions become DoD-wide.
   (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE: Not Applicable.

FY 1992/1993 BIENNIAL BUDGET RDT&E DESCRIPTIVE SUMMARY

PE: #0901218F
PE Title: Civilian Compensation Program

Budget Activity: #6 - Defense-Wide Mission Support

A. (U) RESOURCE ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
Total	4,148	4,478	5,199	5,690	Cont	N/A

B. (U) BRIEF DESCRIPTION OF ELEMENT:
This program element provides funds for payment of civilian compensation benefits for disability due to personal injury sustained while in the performance of duty or due to employment-related disease according to the Federal Employees' Compensation Act (FECA) under 5 U.S.C. Chapter 81. The Department of Labor administers this program but charges the Department of the Air Force for its employee costs. This PE excludes manpower authorizations and costs.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1990 Accomplishments:
- (U) Prior to FY 1990 this program was funded by O&M 3400 to pay disability compensation for all Air Force employees in PE 0901218F regardless of which appropriation funded the civilian pay of personnel generating these costs. 1990 R&D funding paid for injuries and illnesses incurred by R&D employees.

(U) FY 1991 Planned Program:
- (U) To properly realign resources to capture true cost by appropriation, Air Staff has directed that disability compensation shall be paid from the actual appropriation generating the costs. The amounts cited above will fund only disability compensation of personnel assigned to RDT&E activities. This is not a new start but a realignment of charges to the proper appropriation rather than having O&M 3400 pay for all Air Force employees. Funds to cover this R&D program will be transferred from O&M for FYs 90-94 since they were initially included in the O&M SYDP.

(U) FY 1992 Planned Program:
- (U) Continuing level of effort program to compensate employees assigned to RDT&E facilities for work related injury or disease. Increased costs due to medical inflation and 6.1% increase in compensation benefits based on the CPI.

PE: #0901218F
PE Title: Civilian Compensation Program

Budget Activity: #6 - Defense-Wide Mission Support

(U) FY 1993 Planned Program:
- (U) See FY 1992 above

(U) Work Performed By: Private civilian health care providers including hospitals, physicians, and contractors providing nursing services, rehabilitation services, prosthetic appliances, and burial services. Bills for these services are paid by the Department of Labor, which bills the Department of the Air Force for the total cost of benefits and other payments made on account of the injury or death of employees or individuals under the jurisdiction of their agency.

(U) Other Appropriation Funds: Appropriation 3400 will provide disability compensation only for employees assigned to O&M activities.

(U) International Cooperative Agreements: None

FY 1992/1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #1001004F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: International Activities

A. (U) RESOURCES ($ in Thousands)

Project Number & Title	FY 1990 Actual	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
2446 von Karman Institute	400	400	410	420	Cont	TBD
2447 SHAPE Technical Centre/AGARD/Cooperative R&D	2,752	2,888	3,560	3,733	Cont	TBD
Total	3,152	3,288	3,970	4,153	Cont	TBD

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program satisfies Department of Defense (DOD) executive 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 U.S. 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 (VKI) 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.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) Project #2446, von Karman Institute: Funds the continuous U.S. share of NATO support for the von Karman Institute in Brussels, Belgium.

(U) FY 1990 Accomplishments:
- (U) Funded 12.5% of the international budget of the VKI.
- (U) Supported five fellowships for U.S. students at the VKI.
- (U) VKI annually graduates over 70 scientists, conducts 10 lecture series and publishes numerous technical reports.

(U) FY 1991 Planned Program:
- (U) Continue funding U.S. share of VKI's international budget.
- (U) Continue funding five fellowships per year.
- (U) Fund initial stages of VKI/U.S. Air Force Academy cooperative program.

(U) FY 1992 Planned Program:
- (U) Continue funding U.S. share of VKI's international budget.
- (U) Continue funding five fellowships per year.

Program Element: #1001004F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: International Activities

(U) FY 1993 Planned Program:
- (U) Continue funding U.S. share of VKI's international budget.
- (U) Continue funding five fellowships per year.

(U) Work Performed By: Not applicable.

(U) Related Activities:
- (U) Not Applicable.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements:
- (U) NATO support funding agreements.

2. (U) Project #2447, Supreme Headquarters Allied Powers Europe (SHAPE) Technical Centre (STC)/Advisory Group for Aerospace Research and Development (AGARD)/Cooperative Research and Development (R&D): Supports USAF participation in cooperative research and development agencies and groups.

(U) FY 1990 Accomplishments:
- (U) Financially supported the participation of up to 100 experts in AGARD technical panels and working groups.
- (U) Funded 21 scientist and engineer positions at STC.
- (U) Funded all aspects of Air Force international cooperative R&D (ICR&D) to include setting up conferences, travel and per diem to attend meetings, contractor support, and operations at our European liaison offices.

(U) FY 1991 Planned Program:
- (U) Continue AGARD support.
- (U) Continue funding U.S. STC positions.
- (U) Continue funding ICR&D efforts.

(U) FY 1992 Planned Program:
- (U) Continue AGARD support.
- (U) Continue funding U.S. STC positions.
- (U) Continue funding current ICR&D efforts.
- (U) Initiate collaborative Advanced Avionics Architecture development under the 4 Power Air Senior National Representative Counsel.
- (U) Initiate collaborative project to develop new Advanced Theater Airlifter.
- (U) Assume funding responsibility for initiating new cooperative/coproduction programs (previously done by AF/PRI).

Program Element: #1001004F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: International Activities

(U) FY 1993 Planned Program:
- (U) Continue AGARD support.
- (U) Continue funding U.S. STC positions.
- (U) Continue funding ICR&D efforts including those initiated in FY92.

(U) Work Performed By: Leading U.S. civilian and military scientists, engineers and administrators; and the TECHPLAN Corporation of Marlton, New Jersey. The Deputy for International Programs in the Office of the Assistant Secretary of the Air Force (Acquisition) administers the program.

(U) Related Activities: Supports
- (U) US Mutual Weapons Development Data Exchange Program
- (U) Information Exchange Projects
- (U) The Technology Cooperative Program (United Kingdom/Canada/ Australia/New Zealand)
- (U) U.S. Air Force Senior National Representative activities
- (U) NATO Conference of National Armaments Directors
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: This program, as the title indicates, deals entirely with International Cooperative Research, Development, Test and Evaluation (RDT&E). See above for detailed explanation.

MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT-OWNED FACILITIES FUNDED BY RDT&E

Department/Agency: Air Force

Part 1. Utilization of Section 2353, Title 10 Authority

Specialized R&D facilities and/or equipment 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 of all such projects accomplished in FY 90 and planned in FY 91, FY 92 and FY 93.

Section I - Projects Accomplished or Underway

Facility/Equipment	RDT&E Program Element	Contractor	Location	Total Obligational Authority (Thousands of Dollars 1990	1991	1992	1993
Hazardous Processing Facility 1_/*	33110F	General Electric	Cape Canaveral AFS, FL	2,000	6,600	2,000	
Add/Alter Titan (IV) Facility 1_/	34111F	Brown & Root	Vandenberg AFB, CA	12,000	13,000		
Contractor Provided Facilities for Solid Rocket Motor Upgrade 1_/	35119F	Martin Marietta	Vandenberg AFB, CA	4,000			
Launch Complex 40 Mods 1_/*	35119F	Martin Marietta	Cape Canaveral AFS, FL	103,800	61,000	55,000	
Vertical Integration Bldg (VIB) Improvements 2_/	35119F	Martin Marietta	Cape Canaveral AFS, FL	1,410			
VIB Modification, Payload Fairing Cleaning Facility 1_/	35119F	Martin Marietta	Cape Canaveral AFS, FL	3,000			
Addition to Electronic Research Laboratory 1_/*	63250F	MIT Lincoln Lab	Hanscom AFB, MA Bldg 1312L	1,812			

Part 1, Section I - Projects Accomplished or Underway (Cont'd)

Facility/Equipment	RDT&E Program Element	Contractor	Location	Total Obligational Authority (Thousands of Dollars) 1990	1991	1992	1993
Addition to Electronic Research Laboratory 1_/*	63250F	MIT Lincoln Lab	Hanscom AFB, MA Bldg 1302C	195			
Addition to Electronic Research Laboratory 1_/*	63311F	MIT Lincoln Lab	Hanscom AFB, MA Bldg 1312L	2,850			
		Total Part 1, Section I		131,067	80,600	57,000	0

1_/ Listed in previous RDT&E Congressional submittal
2_/ Initial Listing
* Cost, Scope and/or Year Change

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Part 1. Utilization of Section 2353, Title 10 Authority

SECTION II - Projects Planned or Projected

Facility/Equipment	RDT&E Program Element	Contractor	Location	Total Obligational Authority (Thousands of Dollars) 1990	1991	1992	1993
Contractor R&D SLC-3E Atlas II Conversion 2_/	34111F	General Dynamics	Vandenberg AFB, CA		35,000	120,000	
Upgrade Technical Support Bldg (TSB)-2, Bldg 732 2_/	34111F	Lockheed	Vandenberg AFB, CA			2,500	
Contractor R&D Payload Spintest Facility 2_/	34111F	McDonnell Douglas	Cape Canaveral AFS, FL		15,000		
Contractor R&D - Spintest Support Facility 2_/	34111F	McDonnell Douglas	Cape Canaveral AFS, FL		2,000		
Payload Preparation Room Mods 2_/	35119F	Lockheed	Vandenberg AFB, CA			11,000	
Addition to Electronic Research Laboratory 2_/	62702F	MIT Lincoln Lab	Hanscom AFB, MA Bldg 1302V			3,472	
Addition to Electronic Research Laboratory 2_/	63250F	MIT Lincoln Lab	Hanscom AFB, MA Bldg 1302C				1,041
			Total Part 1, Section I	131,067	80,600	57,000	0
			Total Part 1, Section II	0	52,000	136,972	1,041
			Total Part 1	131,067	132,600	193,972	1,041

1_/ Listed in previous RDT&E Congressional submittal
2_/ Initial Listing
* Cost, Scope and/or Year Change

MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT-OWNED FACILITIES FUNDED BY RDT&E

Department/Agency: Air Force

Part 2. Utilization of RDT&E Appropriation for Facilities at Government-Owned/Government-Operated Installations

Chapter 251 (which was approved by the GAO as DODI 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 $200,000 or more, accomplished in FY 90 and planned in FY 91, FY 92, and FY 93.

Section I - Projects Accomplished or Underway

Facility/Equipment	RDT&E Program Element	Location	Total Obligational Authority (Thousands of Dollars) 1990	1991	1992	1993
Equipment Installation Projects						
Install Equipment for Low Observables R&D 1_/*	63003F	Wright-Patterson AFB, OH Bldg 254	1,400			
Peacekeeper Rail Garrison Basing/PIMS 1_/*	64312F	Various	36,800	21,600	5,600	1,200
Small ICBM Program 1_/	64312F	Various		200		200
Reentry Systems Launch Program 1_/*	64312F	Vandenberg AFB, CA	1,900	2,500	1,000	1,000
ETF Plant Automation 1_/	65807F	AEDC, Arnold AFB, TN	140	34	78	161
Freejet Test Cell C2 1_/	Various	AEDC, Arnold AFB, TN	450	600	350	

UNCLASSIFIED

Facility/Equipment	RDT&E Program Element	Location	Total Obligational Authority (Thousands of Dollars) 1990	1991	1992	1993
T3 Modification 1_/	VARIOUS	AEDC, Arnold AFB, TN	463	1,836		
Upgrade Ballistic Range Capability 1_/*	VARIOUS	AEDC, Arnold AFB, TN		1,235	990	1,343
R-Cells Instrument and Control Equipment 1_/*	65807F	AEDC, Arnold AFB, TN	82	244	188	
VKF Drier Reactivation 1_/*	65807F	AEDC, Arnold AFB, TN	587	1,471		
High Temperature Lab Equipment 1_/*	Various	AEDC, Arnold AFB, TN		795	420	
Equipment Installation, Computer-Aided Engineering (CAE) Support, Facilities 30206 and 30207 1_/	65807F	Wright Patterson AFB, OH Bldgs 30206 and 30207	450			
		Total Part 2, Section I	42,272	30,515	8,626	3,904

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Part 2. Utilization of RDT&E Appropriation for Facilities at Government-Owned/Government-Operated Installations

Section II - Projects Planned or Projected

Facility/Equipment	RDT&E Program Element	Location	Total Obligational Authority (Thousands of Dollars) 1990	1991	1992	1993
Equipment Installation Projects						
Install Anechoic Chamber 1_/*	21002F	Wright Patterson AFB, OH Bldg 4A/4F	1,200			
Install Electro-Optics Lab Equip 2_/	21002F	Wright Patterson AFB, OH Bldg 4B	300			
Foundry Processing Equipment 1_/*	62102F	Wright Patterson AFB, OH Bldg 20655		1,200		
Turbine Research Laboratory 1_/*	62203F	Wright Patterson AFB, OH Bldg 71B, J-Bay		795		
Install Combustion Air Heaters and Exhaust System (1_/*	62203F	Wright Patterson AFB, OH Bldg 490			750	
Install Chiller/Cooling Tower System 2_/	62203F	Wright Patterson AFB, OH		250		
Install Electronic Warfare Hot Bench Development System 1_/*	62204F	Wright Patterson AFB, OH Bldg 620			500	
Install Equipment for Clean Room Support Area 1_/*	62204F	Wright Patterson AFB, OH Bldg 620		600		
Install Environmental Control System for Clean Rooms 1_/*	62204F	Wright Patterson AFB, OH Bldg 620		700	700	300

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Total Obligational Authority (Thousands of Dollars)

Facility/Equipment	RDT&E Program Element	Location	1990	1991	1992	1993
Install Metal Organic Molecular Beam Epitaxial System 1_/*	62204F	Wright Patterson AFB, OH Bldg 620		495	495	
Install Equipment for RASPL Relocation 1_/*	62204F	Wright Patterson AFB, OH Bldg 620			400	
Install Advanced Lithographic System 2_/	62204F	Wright Patterson AFB, OH Bldg 620				1,500
Installation of Pit for R&D Flight Simulators in Bldg 20145, Rm 210 2_/	63205F 63245F	Wright Patterson AFB, OH Area B, Bldg 20145		140		
Range 3 Modification and Replacement Equipment 2_/	64231F	Wright Patterson AFB, OH Bldg 20098		400	300	
Altr Bldg for ASAT Testing 2_/	12424F	Peterson AFB, CO Bldg 1844		78	780	
Freejet Test Cell C-1 1_/	VARIOUS	AEDC, Arnold AFB, TN		1,000	2,000	3,000
Test Unit Support System 1_/*	VARIOUS	AEDC, Arnold AFB, TN		55	293	293
Signal Cond. Eq. 2_/	65807F	AEDC, Arnold AFB, TN			295	533
Improve ETF Communication System 2_/	65807F	AEDC, Arnold AFB, TN			184	435
Scientific/Engineering Computer Acquisition Project (SECAP) 2_/	VARIOUS	AFFTC, Edwards AFB, CA		222	222	366
Computer Aided Engineering (CAE) System 2_/	65807F	AFFTC, Edwards AFB, CA		150		

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Part 2, Section II - Projects Planned or Projected (Cont'd)

Facility/Equipment	RDT&E Program Element	Location	Total Obligational Authority (Thousands of Dollars) 1990	1991	1992	1993
Avionics Lab, Bldg 1870 2_/	CLASSIFIED	AFFTC, Edwards AFB, Ca		500		
Install Cray Computer System 2_/	VARIOUS	Wright Patterson AFB, OH Bldg 676			578	
Test Facilities						
None						
Temporary Facilities						
Special Test Fluid Storage/Handling Fac 2_/	11127F	AFFTC, Edwards AFB, CA		268		
Cheyenne Mountain Upgrade (CMU) 2_/	12310F	Peterson AFB, CO		328		
HAVE STARE Temporary Radar Support Structure 2_/	31315F	Vandenberg AFB, CA				1,224
Temporary Facility for Airborne Imagery Transmitter (ABIT) 1_/*	63727F	Wright Patterson AFB, OH Bldg 620			300	
	Total Part 2, Section I		42,272	30,515	8,626	3,904
	Total Part 2, Section II		1,500	7,181	7,797	7,651
	Total Part 2		43,772	37,696	16,423	11,555

1_/ Listed in previous RDT&E Congressional submittal
2_/ Initial Listing
* Cost, Scope and/or Year Change

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MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT-OWNED FACILITIES FUNDED BY RDT&E

Department/Agency: Air Force

Part 3. Utilization of RDT&E Appropriation for Minor Construction

For in-house installations, construction projects in support of R&D for $200,000 or less are funded from RDT&E appropriations. Such expenditures are authorized by 10 USC 2805 and the applicable provisions of the current DoD Appropriations 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 90 and estimated amounts planned for FY 91, FY 92, and FY 93. All minor construction projects must result in a complete and usable facility. In no event is two or more minor construction projects to be contrived to form a usable facility.

	Total Obligation Authority (Thousands of Dollars)			
	FY 90	FY 91	FY 92	FY 93
Summary of Minor Construction Funded By RDT&E, Air Force	17,289	9,283	22,798	0
Summary of Major Improvements to and Construction of Government-owned Facilities				
Subtotal Part 1	131,067	132,600	193,972	1,041
Subtotal Part 2	43,772	37,696	16,423	11,555
Subtotal Part 3	17,289	9,283	22,798	0
Grand Total	192,128	179,579	233,193	12,596

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1 COMPONENT	FY 1990	RDT&E FACILITIES PROJECT DATA	2 DATE
(AFSC) AIR FORCE			30 Jul 90

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
CAPE CANAVERAL AFS, FL	Contractor R&D - VIB IMPROVEMENTS

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
35119F			1,410

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Vertical Integration Building (VIB) Improvements				1,410

10 DESCRIPTION OF PROPOSED CONSTRUCTION

PROJECT: Provide improvements to the existing VIB to enable additional storage capacity for Titan IV core vehicles. Includes floor strengthening and crane upgrade in the high bay.

REQUIREMENT: Some Titan IV launches from LC-40 and LC-41 will be "launch on demand", which drives a need for extra storage to permit a flexible launch schedule. This is a contractor facility required to permit the contractor to accomplish his contract.

CURRENT SITUATION: The VIB, as currently configured, does not have the capability to store a sufficient number of Titan IV core vehicles to support the "launch on demand" requirement.

IMPACT IF NOT PROVIDED: Critical defense payloads requiring "launch on demand" to replenish unhealthly constellations would not be launched in a timely fashion, leading to a degradation of the nation's defense posture.

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1 COMPONENT	FY 1991/92 RDT&E FACILITIES PROJECT DATA	2 DATE
Air Force		2 AUG 1990

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
Vandenberg AFB, CA	Contractor R&D - SLC-3E Atlas II Conversion

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
34111F	312-477		155,000

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Convert SLC-3	LS			155,000
Design Cost (Non-add) (Phase I $2.1M)(Phase II $7.2M)				(9,300)
Equipment from Other Appropriations (Non-add) (Phase I $10.0M)(Phase II $70.0M)				(80,000)

10. DESCRIPTION OF PROPOSED INSTALLATION

Convert Space Launch Complex (SLC) 3 to provide Atlas Centaur (Atlas II) launch capability from the Western Test Range at Vandenberg AFB. Capability will include on-pad payload encapsulation and remote launch control. Site security will be upgraded to comply with regulations. Facility and ground system modifications and payload communication system installation required by the Atlas II vehicle shall be accomplished.

Project: Provide Atlas II vehicle processing and launch capability from Vandenberg AFB.

Requirement: Atlas II launch services at Vandenberg AFB are required to provide access to space for critical Government payloads. This facility is Government Owened-Contractor Operated required for the contractor to perform his contract.

Current Situation: Atlas II launch capabilities are not available from Vandenberg AFB.

Impact If Not Provided: Access to space for critical payloads will not be possible.

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1 COMPONENT	FY 19 92 RDT&E FACILITIES PROJECT DATA	3 DATE
Air Force		2 AUG 90

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
Vandenberg AFB, CA	Contractor R&D - Upgrade TSB-2, Bldg 732

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
34111F	312-476		2,500.0

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Upgrade TSB-2, Bldg 732	LS			2,500.0
Addition	SF	15,200	120.0	(1,824.0)
Utilities Upgrade	LS			(250.0)
Security (Physical)	LS			(426.0)
Design Cost (Non-add)				(150.0)
Equipment from Other Appropriations (Non-add)				(1,200.0)

10. DESCRIPTION OF PROPOSED INSTALLATION

Addition of a pre-engineered metal building to the existing Technical Support Building (TSB) #2 with supporting utilities, communications and security systems. Space shall be allocated for payload integration, data processing, equipment calibration, data acquisition, security equipment and communications equipment. Exterior walls shall meet a sound transmission coefficient of 45 and interior areas shall include sound masking. All security and communications equipment shall have emergency backup power. Additionally, a secure communications duct shall be constructed between TSB-2 and the Launch Operations Building, Bldg 730.

Project: Construct an addition to the existing TSB, Bldg 732, for Aerospace Support Contract use in association with Titan processing and launch programs at Vandenberg AFB.

Requirement: Secure, environmentally controlled space is required on Space Launch Complex (SLC) 4 for vehicle-payload integration conducted by support contractors for Titan programs.

Current Situation: Space does not exist at SLC-4 for vehicle-payload integration by Government contractors. Currently facilities are used located on North Vandenberg, approximately 17 miles away.

Impact If Not Provided: Contractor efficiency will continue to be limited and vehicle-payload security will be in jeopardy.

1. COMPONENT	FY 19 91 RDT&E .... DATA	2. DATE
Air Force		2 AUG 1990

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Cape Canaveral AFS, FL	Contractor R&D Payload Spintest Facility

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
34111F	312-477		15,000.0

9. COST ESTIMATES

ITEM	UNIT	QUANTITY	UNIT COST	COST ($000)
Payload Spintest Facility	LS			15,000.0
Design Cost (Non-add)				900.0)
Equipment from Other Appropriations (Non-add)				4,000.0)

10. DESCRIPTION OF PROPOSED INSTALLATION

Construct concrete and concrete masonry for the Payload Spintest Facility. The facility will be a hazardous processing building for the test and checkout of essential Government payloads by contractor personnel. Interfaces for ground support equipment to include fuel and oxidizer systems, breathing air, nitrogen, air pollution control equipment, shop air, helium, standby power and compressed air. Technical, facility grounding and lightning protection will be provided. The high-bay portion of the facility shall include a 15-ton crane, an airlock, explosion proof fixtures and outlets and a 90-ft candle lighting intensity. Additionally, physical security requirements will be provided as required.

Project: Provide a spintest facility for contractor processing of Government payloads.

Requirement: A complete and usable facility for test and checkout of Government payloads with remote control capability meeting all safety and security requirements.

Current Situation: Facilities are not available to process the payloads required by current Government programs.

Impact If Not Provided: Contractors will be unable to process Government payloads.

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1 COMPONENT	FY 19 91 RDT&E FACILITIES PROJECT DATA	2 DATE
Air Force		2 AUG 90

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
Cape Canaveral AFS, FL	Contractor R&D Spintest Support Facility

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
34111F	312-477		2,000.0

9 COST ESTIMATES

ITEM	UNIT	QUANTITY	UNIT COST	COST ($000)
Spintest Support Facility	LS			2,000.0
Control Facility	SF	11,000	135.0	(1,485.0)
Security (Physical)	LS			(250.0)
Communication Duct	LF	1,500		(180.0)
Utilities	LS			(85.0)
Design Cost (Non-add)				(120.0)
Equipment from Other Appropriations (Non-add)				(4,000.0)

10. DESCRIPTION OF PROPOSED INSTALLATION

Construct a Spintest Support Facility consisting of a payload control facility, secure communications duct to the existing Payload Spintest Facility, necessary security appurtenances and supporting utilities. The control facility shall be concrete block with environmental controls for safe operation of control and communication equipment. Communications duct shall be concrete encased rigid conduit with surrounding security fence.

Project: Provide a Spintest Support Facility for remote processing of critical Government payloads.

Current Situation: Secure control facilities are not available for safe processing of critical payloads.

Impact If Not Provided: Processing of critical Government payloads will not be accomplished.

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1 COMPONENT	FY 1992 RDT&E FACILITIES PROJECT DATA	2 DATE
(AFSC) AIR FORCE		15 NOV 90

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
VANDENBERG AFB CA	PAYLOAD PREPARATION ROOM MODS

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
35119F		AFR 80-22	11,000

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
MODIFICATIONS OF THE PAYLOAD PREPARATION ROOM AIRLOCK	LS			11,000

10 DESCRIPTION OF PROPOSED CONSTRUCTION

PROJECT: Modification to provide the capability to process Titan IV payloads off-line in the Payload Preparation Room (Bldg 375) at Space Launch Complex 6 (SLC-6), Vandenberg AFB, CA.

REQUIREMENT: A processing facility capable of successfully encapsulating and allowing removal of Titan IV No Upper Stage (NUS) payload. The facility must also provide the capability to transfer an encapsulated payload to the payload transportation system.

CURRENT SITUATIONS: The existing facility was designed for payloads with a maximum length of 60 feet. The design also accommodated vertical removal at a level to allow insertion into the Space Shuttle Orbiter payload bay. The current capabilities can not accommodate the vertical removal of an encapsulated payload of 67 feet. Launch requirements from SLC-4 East require an off-line processing facility by Jan 93. A contract was awarded to Lockheed in Jul 90 to support processing for launch of Titan IV's from SLC 6. Their proposal included these alterations to enable them to meet the requirements of the request for proposal.

IMPACT IF NOT PROVIDED: Inability to achieve an off-line payloads processing capability for SLC-4E by Jan 93 will result in a backlog of Titan IV payloads at Vandenberg AFB. If the capability to process payloads off-line at Vandenberg AFB is not provided, all payload processing for both SLC-4E and SLC-6 will have to be performed on the booster serially. National security will be impacted if the numerous heavy defense payloads which require the Titan IV booster cannot be launched at the rate required.

1 COMPONENT (AFSC) AIR FORCE	FY 19 92 MILITARY CONSTRUCTION PROJECT DATA	2 DATE 7/23/90

3 INSTALLATION AND LOCATION	4. PROJECT TITLE
Hanscom AFB, Massachusetts	Addition to Electronic Research Laboratory - Building V

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8. PROJECT COST ($000)
63250F	317-315	MXRD-86-0603	3,472

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Addition to Electronic Research Laboratory	SF	14,000	213.71	2,992
Structural	SF			(599)
Architectural	LS			(1,048)
Partitions	LS			(447)
Electrical	LS			(358)
Mechanical	LS			(540)
Subtotal				2,992
Contingency (10%)				299
Total Contract Cost				3,291
Supervision, Inspection & Overhead (5.5%)				181
Total Request				3,472
Design (Non-Add)				330

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Construct an addition of 14,000 square feet to Building V to include heating, ventilation and air conditioning systems, lighting, test and control areas, and a special secure facility. Construction will be of poured concrete walls, concrete floor slab and caisson foundations, steel beam and column frame with semi-temporary interior partitions, except for secure spaces which will have standard acqustic and electronic isolation provisions.

PROJECT: Provide laboratory and secure vault space in Building V, Lincoln Laboratory.

REQUIREMENT: The Image Processing Laboratory is required to support the Strategic Relocatable Target (SRT) Program which will develop the physics data base to permit the development of necessary mathematics for detecting strategic military ground targets using high-resolution millimeter-wave synthetic aperture radars. The system applications of development will be for manned bombers and standoff surveillance platforms. The program will be the national source of physics data for a wide variety of Air Force and other service programs which are developing techniques for detecting and attacking strategic targets. The Image Processing Laboratory will be constructed as a secure compartmented information facility (SCIF).

CURRENT SITUATION: The requirement is a new task on an existing program for which facilities do not exist.

IMPACT IF NOT PROVIDED: Lincoln Laboratory will not be able to undertake the SRT Program if the space is not provided which will be detrimental to or eliminate the development of techniques for detection of strategic ground targets using this technology.

1 COMPONENT (AFSC) AIR FORCE	FY 1993 MILITARY CONSTRUCTION PROJECT DATA	2 DATE 7/23/90

3 INSTALLATION AND LOCATION	4. PROJECT TITLE
Hanscom AFB, Massachusetts	Addition to Electronic Research Laboratory - Building 1302C (N)

5 PROGRAM ELEMENT	6 CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
63250F	317-315		1,041

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Addition to Electronic Research Laboratory Building 1302C (North)	SF	3,350	267.76	897
Architectural	LS			(425)
Mechanical	LS			(283)
Electrical	LS			(142)
Plumbing	LS			(47)
Subtotal				897
Contingency (10%)				90
Total Contract Cost				987
Supervision, Inspection & Overhead (5.5%)				54
Total Request				1,041
Design (Non-Add)				300

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Construct an addition of 3,350 square feet to Building 1302C (north side), including 2,500 square feet of specialized optical/chemical laboratory space, part of which will be upgradeable to clean room space. This includes heating and ventilation systems, lighting and storage areas. Construction will be of poured concrete floor slab and caisson foundations, steel beam and column frame and cinderblock wall construction with semi-temporary interior partitions, as allowable, as well as a dedicated support corridor for segregated handling of hazardous research materials.

PROJECT: Provide expanded and upgraded laboratory and support space within Building 1302C, Lincoln Laboratory.

REQUIREMENT: Specialized facilities are required for contractor research and development in numerous research projects requiring a specialized optical/chemical laboratory for development of submicron laser-assisted semiconducter device-processing technologies. These techniques are highly specialized and include the use of excimer lasers, as well as ion-beam assisted chemical-vapor processing. Particle contamination is of significant concern, as is adequate temperature and humidity control. Large quantities of ventilation are required to ensure safe operations when using toxic materials. This project provides sufficient space for dedicated air-handling systems to ensure adequate handling of toxic substances.

CURRENT SITUATION: Lincoln Laboratory facilities are furnished by the Government for performance on various R&D programs. The present area available for the processingg and testing of the required technologies does not possess a sufficiently clean or does not have the stablilized environment necessary to ensure reproducible results. The ability to process and test large, complex devices is curtailed by the quality of the laboratory space presently available. Additionally, a dedicated corridor system is needed to isolate the delivery of hazardous research materials from peopled exit areas.

IMPACT IF NOT PROVIDED: Failure to provide the required space for constuction of specialized laboratory space will result in continued poor device yields, extended processing time and higher unit costs. It will be impossible to control contamination and produce the required prototypes when performing this type of device development technology. Lack of this space will hamper our ability to design, develop and test microelectronic components which are critical to maintenance of the national and DoD lead in applications of these devices. Failure to construct the dedicated corridor system increases the complexity of toxic materials deliveries and increases the risk of accidental exposure.

1 COMPONENT (AFSC) AIR FORCE	FY 1990 RDT&E FACILITIES PROJECT DATA	2 DATE 11 SEP 90
3 INSTALLATION AND LOCATION WRIGHT-PATTERSON AFB, OHIO	4 PROJECT TITLE EQUIP INSTALLATION, INST EQUIP FOR ELECTRO-OPTICS LAB, 4B	

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
21002F	317-311	EO 90-2208	300.0

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Equipment Installation, Install Equipment for Electro-Optics Lab, 4B				300.0
Air Conditioning	LS			(200.0)
Secondary Utilities	LS			(100.0)
Cost of Purchased Equipment (Non-Add)				(35.0)
Total Equipment and Installation Cost (Non-Add)				335.0
Other Non-Add Costs (Design)				(20.0)
Minor Construction (Non-Add) (Project No. 902208)				(200.0)

10 DESCRIPTION OF PROPOSED Installation: Provide air conditioning and all secondary utilities to support R&D equipment. *

SPECIFIC PURPOSE: To support USAF R&D programs involving avionics electro-optic devices.

REQUIREMENT: Equipment installation is required to perform increased in-house research and development on avionics electro-optics.

CURRENT SITUATION: There is currently insufficient facilities to support increased workload and number of electro-optics evaluations required.

IMPACT IF NOT PROVIDED: Inability of the Avionics Laboratory to provide adequate and responsive R&D mission support.

* Required to provide temperature and humidity control, so optical lens and mirrors will not fog during operation.

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1 COMPONENT	FY 1991 RDT&E FACILITIES PROJECT DATA	2 DATE
AF (AFSC)		4 SEP 1990

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
WRIGHT-PATTERSON AFB, OHIO (AFLC)	INSTALL CHILLER AND COOLING TOWER, BLDG 18C

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
62203F	318-612	NOT ASSIGNED	250.0

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQUIPMENT INSTALLATION, INSTALL CHILLER AND COOLING TOWER, BLDG 18C	LS			250.0
SITE PREPARATION	LS			(95.0)
SECONDARY UTILITIES	LS			(89.0)
INSTALL EQUIPMENT	LS			(66.0)
COST OF PURCHASED EQUIPMENT (NON-ADD)	LS			425.0
TOTAL EQUIPMENT AND INSTALLATION COST				675.0
OTHER NON-ADD COSTS (DESIGN)				(45.0)
COMPANION MINOR CONSTRUCTION				(100.0)

10 DESCRIPTION OF PROPOSED CONSTRUCTION

MINOR CONSTRUCTION: The work to install, process chiller and cooling water system.
EQUIPMENT INSTALLATION: Install a 300 ton capacity chiller and cooling water system with a capacity of 915 tons at 75°F Wet Bulb and a Ramp of 30°F.
PROJECT: Install aforementioned equipment to support computer systems and research areas environmental temperature requirements in the APPL complex.
CURRENT SITIATION: Present equipment is inadequate in size and unreliable due to age and condition. Sensitive computer equipment is subjected to potential damage as a result of frequent equipment malfunctions. This project will ensure adequate cooling capacity for planned growth of computer and research facilities and will increase system reliability.
IMPACT IF NOT PROVIDED: Without this project, research and computer facilities will be subjected to frequent outages, jeopardizing high value R&D equipment.

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1 COMPONENT	FY 93/94 RDT&E FACILITIES PROJECT DATA	2 DATE
AF (AFSC)		27 JUL 1990

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
WRIGHT-PATTERSON AFB, OHIO (AFLC)	INSTALL ADVANCED LITHOGRAPHIC SYSTEM, BLDG 620

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
62204F	310-932	EQ 93-2200	3,000.0

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
INSTALL ADVANCED LITHOGRAPHIC SYSTEM BLDG 620				3,000.0
SPECIAL FOUNDATIONS	LS			(1,750.0)
AIR CONDITIONING	LS			(500.0)
SECONDARY UTILITIES	LS			(750.0)
COST OF PURCHASED EQUIPMENT (NON-ADD)				(4,250.0)
TOTAL EQUIP AND INSTALLATION COST (NON-ADD)				(7,250.0)
OTHER NON-ADD COSTS (DESIGN)				(100.0)

10 DESCRIPTION OF PROPOSED CONSTRUCTION INSTALLATION: Special foundations, air conditioning and secondary utilities.

PROJECT: Install suitable vibration isolated foundation and Class 1 clean room environmental module with associated support equipment.

REQUIREMENT: An advanced lithographic system is required to provide for the in-house development and support of advanced research in microwave, millimeter wave, ultra-high speed analog transistors, digital integrated circuits and advanced electro-optic devices. The equipment is necessary to meet the Air Force's need to meet the miniaturization requirements of its advanced electronic devices with dimensions below 0.1 microns.

CURRENT SITUATION: Present research and development of advanced microelectronic circuits is limited to the use of wet lithography and electron beam lithography methods. These existing approaches have limits that prevent the future development of advanced weapon system designs.

IMPACT IF NOT PROVIDED: The technical expertise required for planning and implementing technology and sound research and development techniques in analog, digital, and electro-optic electronics will be seriously eroded. Continued erosion could significantly reduce the Air Force's independence and potentially increase our reliance on foreign sources for integrated circuit technology.

16:EQ-2200

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1 COMPONENT	FY 19 91 MILITARY CONSTRUCTION PROJECT DATA	2 DATE
(AFSC) AIR FORCE		27 Jul 90

3 INSTALLATION AND LOCATION	4. PROJECT TITLE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO Bldg 145, Room 210	Installation of Pit for Two R&D Flight Simulators

5 PROGRAM ELEMENT	6 CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
63205F, 63245F	311-115	EQ 90-2240	140.0

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
INSTALLATION OF PIT FOR TWO R&D FLIGHT SIMULATORS IN ROOM 210				140.0
REMOVAL OF VINYL FLOOR TILES	LS			(30.0)
INSTALLATION OF SHEET PILINGS	LS			(10.0)
EXCAVATION	LS			(50.0)
CONSTRUCT POURED WALLS AND FLOOR	LS			(40.0)
INSTALL SAFETY RAILINGS AND 2 LADDERS	LS			(10.0)
COST OF PURCHASED EQUIPMENT (NON-ADD)				(8,263.0)
TOTAL EQUIPMENT AND INSTALLATION COSTS (NON-ADD)				(8,403.0)
OTHER NON-ADD COSTS				
DESIGN				(20.0)
IN-HOUSE ACCOMPLISHED RENOVATIONS				(150.0)

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Description Of Proposed INSTALLATION: Construct a pit, with approximate dimensions of 87 by 41 feet, and 9 feet deep within existing large bay of building. Includes removal of vinyl floor tiles, driving of sheet piles, excavation, construction of pit's poured concrete walls and floor, and installation of safety railings and two access ladders.

SPECIFIC PURPOSE: To support Air Force R&D engineering flight simulation capabilty development.

PROJECT: Provide pits in which two "dome" style R&D flight simulators will be installed. Pit provides extra room height needed.

REQUIREMENT: Construction of two additional research flight simulators is required to provide the qualitative and quantitative increase in facility resources needed to support planned and projected simulation programs.

CURRENT SITUATION: There are currently two primary research flight simulators present at the facility: the Large Amplitude Multimode Aerospace Research Simulator, and the Mission Simulator-1 (MS-1). These two existing simulators are insufficient to support upcoming simulation programs which stress the analysis and evaluation of intra and inter aircraft subsystems and tactics in a complex multi-aircraft combat environment. The new simulators will be similar in design to MS-1.

IMPACT IF NOT PROVIDED: Failure to develop the required research simulators will seriously impact the facility's ability to accomplish it's AF R&D mission. Only through the analysis and evaluation of these advanced aircraft technologies in a full mission environment can the most promising technologies be identified, refined, and incorporated into weapon systems in a cost effective and timely manner.

1 COMPONENT	FY 1991/92 RDT&E FACILITIES PROJECT DATA	2 DATE
AFSC AIR FORCE		26 SEP 90

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
WRIGHT-PATTERSON AIR FORCE BASE, OH	RANGE 3 MODIFICATION AND REPLACEMENT OF EQUIPMENT

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
0605131D 64231F	311-174	EQ91-2201	700.0

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQUIPMENT INSTALLATION, INSTALL EQUIPMENT TO PROVIDE GREATER AIRFLOW FOR AIRCRAFT SURVIVABILITY RESEARCH FACILITY				700.0
REMOVAL OF EXISTING EQUIPMENT	LS			(75.0)
INSTALLATION OF SUPPORT EQUIPMENT	LS			(400.0)
INSTALLATION OF AIRFLOW DUCTING	LS			(150.0)
INSTALLATION OF ENGINES	LS			(75.0)
COST OF PURCHASED EQUIPMENT (NON-ADD)				(1500.0)
TOTAL EQUIPMENT AND INSTALLATION COSTS (NON-ADD)				(2200.0)
OTHER NON-ADD (DESIGN)				(600.0)
MINOR CONSTRUCTION (NON-ADD)				(100.0)

10 DESCRIPTION OF PROPOSED CONSTRUCTION

INSTALLATION: R&D equipment removal and modification/replacement of equipment to provide increased airflow for the Aircraft Survivability Research Facility Range 3 to meet future test requirements.
SPECIFIC PURPOSE: Provide test facilities to support Congressionally mandated Live Fire Test & Evaluation (LFT&E) (Chapter 139, Title 10 U.S.C.) on the C-17 aircraft and future systems (examples: CAS, ATF). Support USAF aircraft survivability research and development.
PROJECT: Equipment installation to meet C-17 LFT&E requirements and improve survivability research capability.
REQUIREMENT: Increased airflow is urgently required to meet testing conditions necessary to adequately perform C-17 LFT&E and any future large scale systems. In addition, increased airflow will allow larger scale R&D efforts to provide future aircraft with more reliable and maintainable systems for aircraft survivability. The ability to resist combat damage is paramount in a smaller more mobile Air Force.
CURRENT SITUATION: The Flight Dynamics Lab Survivability Enhancement Branch is responsible for developing aircraft survivability technologies as well as being designated the Center of Expertise responsible for LFT&E of select future systems. Present airflow does not allow large scale test article testing throughout the required testing scenarios.
IMPACT IF NOT PROVIDED: The Flight Dynamics Lab will be severely handicapped in its ability to perform the Congressionally mandated testing on systems such as the C-17. The research and development efforts will be limited to many subscale articles and will not allow for improved survivability technologies to be realistically evaluated as effectively.

U.S. GOVERNMENT PRINTING OFFICE: 1988-201-372:80628

1. COMPONENT	FY 91/92	RDT&E FACILITY PROJECT DATA (computer generated)	2. DATE
AIR FORCE			

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
PETERSON AFB, CO	ALTER BLDG 1844 FOR ASAT TESTING

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST($000)
12424F	819-443	RSDS913550	857.9

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
ALTER BLDG 1844 FOR ASAT TESTING	SF	1,200	498	597.6
SUPPORTING FACILITIES				134.7
ELECTRICAL		1	84,800	(84.8)
HVAC		1	49,900	(49.9)
SUBTOTAL				732.3
CONTINGENCY (10%)				73.2
TOTAL CONTRACT COST				805.5
SUPERVISION, INSPECTION AND OVERHEAD (6.5%)				52.4
TOTAL FUNDED COST				857.9

10. Description of Proposed Construction: Facility modifications required to meet the needs of RDT&E computers and communications equipment. Work includes miscellaneous wall, floor and ceiling modifications along with construction of new walls, floors and ceilings. Modify existing and or install new HVAC and electrical power.

11. REQUIREMENT: 1,200 SF ADEQUATE: 0 SUBSTANDARD: 0

PROJECT: Construct a TEMPEST protected Sensitive Compartmented Information Facility (SCIF) within building 1844.

REQUIREMENT: A SCIF and TEMPEST certified facility is required to test the ASAT System prior to deployment at Cheyenne Mountain AFB, CO. The existing space in Bldg 1844 must be modified to meet the Research, Development, Test, and Evaluation computers and communications equipment associated with testing the ASAT System.

CURRENT SITUATION: The existing ASAT weapons and systems are not operational. This facility will allow for the necessary testing of ASAT's ability to provide satellite tracking and targeting information; Battle Management/Command, Control, and Communications (BM/C3); and kill assessment for ASAT operations.

IMPACT IF NOT PROVIDED: USCINCSPACE will be unbale control the ASAT mission as directed by the National Command Authorities. No single, comprehensive space surveillance capability will exist to support the ASAT mission of enemy satellite tracking, targeting, and kill assessment.

ADDITIONAL: CURRENT MISSION: 0% NEW MISSION: 100%

DD FORM 1391, DEC 76 Previous editions are obsolete. Page No

1 COMPONENT	FY 1992-94 RDT&E FACILITIES PROJECT DATA	2 DATE
AIR FORCE		24 Jul 90

3 INSTALLATION AND LOCATION	4 PROJECT TITLE EQUIPMENT INSTALLATION
ARNOLD AFB, COFFEE COUNTY, TN 37389-5000	Upgrade Signal Conditioning Equipment

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
65807?	318-614	ANZY818012	$1,332

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Equipment Installation				
Upgrade Signal Conditioning Equipment	LS			1332
Signal Wiring System	LS			(1056)
Other Equipment Installation				(276)
Cost of Purchased Equipment (Non-Add)				(4908)
Total Equip. Installation & Equip. Cost				(6240)
Other Non-add Costs:				
Design				(279)
Checkout				(332)
Execution				(213)

10 DESCRIPTION OF PROPOSED INSTALLATION

PROJECT: Procure and install replacement signal conditioning equipment and interconnect cabling to replace obsolete and unreliable equipment in all Engine Test Facility test units (T1, T2, T4, T5, T6, T7, J1, J2, and J3).

REQUIREMENT: Replacement equipment is required to improve reliability and operation efficiency and reduce test preparation time and cost.

CURRENT SITUATION: Existing signal conditioning equipment, and interconnect cabling is obsolete and unreliable requiring excessive manpower for setup, checkout, and maintenance. As the equipment continues to age, reliability will decrease further as replacement parts become unavailable.

IMPACT IF NOT PROVIDED: Data Systems reliability will decrease, data quality will be reduced, and manpower intensive operations will continue resulting in excessive maintenance costs and test unit operational delays. Current capability to support development testing of rocket and jet engine propulsion systems will be significantly reduced.

1 COMPONENT	FY 1992-96 RDT&E FACILITIES PROJECT DATA	2 DATE
AIR FORCE		24 JUL 90

3 INSTALLATION AND LOCATION	4 PROJECT TITLE Equipment Installation
ARNOLD AFB, COFFEE COUNTY, TN, 37389-5000	IMPROVE ETF COMMUNICATIONS SYS

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
65807F	318-614	ANZY910212	917.8

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Equipment Installation				
Improve ETF Communications Sys	LS			917.8
Cost of Purchased Equipment (Non-Add)	LS			(1093.7)
Total Equipment Installation and Equip Cost	LS			(2011.5)
Other Non-Add Costs:				
Design				(386.7)
Checkout				(115.0)
Minor Construction				(0)

10 DESCRIPTION OF PROPOSED CONSTRUCTION

PROJECT: Modification of the ETF Intercommunication System to provide communication support for all altitude test cells and the central plant.

REQUIREMENT: This project is required to provide communication systems to safely set up, operate, and maintain the test units and plant equipment. A multi-channel system with local channel selection is required to provide communications for multiple work crews. Renovation of the paging system is required to provide direction and warning of personnel. Wireless intercom systems are required to service remote areas. The systems must be capable of reliably passing critical test information.

CURRENT SITUATION: The existing intercom systems have the following deficiencies.

- The systems will not meet existing conference requirements.
- Existing cabling has been water-damaged and results in destructive failures
- Existing hardware and cabling are not reliable for transmitting critical information
- Plant paging speaker supports are aging and are breaking due to mechanical fatigue
- Required areas of coverage are not being properly serviced

IMPACT IF NOT PROVIDED: The AEDC Test Facility will continue to be hampered by the limitations of the communication system. The ability to efficiently direct personnel, conduct test, and provide warning of hazardous conditions will continue to be compromised. The system will continue to deteriorate beyond the reliable state for testing

DD FORM 1 DEC 76 1391 PREVIOUS EDITIONS MAY BE USED UNTIL EXHAUSTED PAGE NO 1 COMPUTER GENERATED

1 COMPONENT	FY 91-93 RDT&E FACILITIES PROJECT DATA	2 DATE
AIR FORCE (AFSC)		1 AUG 90

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
EDWARDS AIR FORCE BASE, CALIFORNIA	EQUIPMENT INSTALLATION SCI/ENG COMP. ACQUISITION PROJ. (SECAP)

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8. PROJECT COST ($000)
VARIOUS	317-315	FSPM912540	810.0

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQ. INSTALLATION, SECAP				810.0
REMOVE SINGLE CPU CYBER, PREP SITE #1				(222.0)
REMOVE DUAL CPU CYBER, PREP SITE #2				(222.0)
REMOVE S-1, PREP SITE #2				(366.0)
TOTAL PROJECT COST				810.0
EQUIPMENT COST (NON-ADD)				16,840.0

10 DESCRIPTION OF PROPOSED RDT&E WORK: Remove the existing CYBER equipment from Bldg 1440. Prepare locations within the building for the SECAP equipment.

11. REQUIREMENT:

SPECIFIC PURPOSE: Provide a modern and efficient computer system for use by the scientific and engineering groups at the Air Force Flight Test Center.

PROJECT: Remove existing computer systems from Bldg 1440, and install new SECAP computers.

REQUIREMENT: Scientists and engineers at the AFFTC require modern, efficient computing resources to perform the sophisticated tasks associated with flight testing.

CURRENT SITUATION: Existing computers, hardware and software are outdated. These older machines do not have the speed, storage or memory to perform modern engineering and scientific calculations.

IMPACT IF NOT PROVIDED: Engineers and scientists will be unable to provide the AFFTC with state-of-the-art support. Test programs, such as the Advanced Tactical Fighter (ATF) will be impacted by the lack of computer resources. Program delays are inevitable and Air Force costs would rise.

1 COMPONENT	FY 1991 RDT&E FACILITIES PROJECT DATA	2 DATE
AIR FORCE (AFSC)		24 JUL 90

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
EDWARDS AIR FORCE BASE, CALIFORNIA	EQUIPMENT INSTALLATION, CAE SYSTEM

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
65807F	311-174	FSPM922530	150.0

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQ. INSTALLATION, CAE SYSTEM	LS			150.0
TOTAL PROJECT COST				150.0
EQUIPMENT COST (NON-ADD)				3,600.0

10 DESCRIPTION OF PROPOSED RDT&E WORK: Install a Computer Aided Design, drafting, engineering analysis and Manufacturing (CADD/CAE/CAM) system. This system will be located primarily in Bldgs 1400 and 1600, but will also have nodes located in Bldgs. 1220, 1407, 1414, 1440, 1623, 1810, 1820, 1870, 1874, 3940, 3950, and 4505. Include all mechanical, electrical and structural work required to install a complete and usable CADD/CAE/CAM system.

11. REQUIREMENT:

SPECIFIC PURPOSE: Install a modern, state-of-the-art computer system to provide engineering and manufacturing capability for Class II modifications to be performed at the Air Force Flight Test Center.

PROJECT: Install a CADD/CAE/CAM hardware, including mainframe, nodes, Local Area Networks (LAN) and workstations. Raised computer floors, additional HVAC, node installation, and workstation wiring is to be included.

REQUIREMENT: A computer aided design/drafting/engineering system is required to provide design, analysis, manufacturing and documentation capability for class II modifications to flight test aerospace vehicles.

CURRENT SITUATION: The computer system currently in use is of limited capability and obsolete design. Two axis manufacturing, limited analysis/design software as well as older hardware combine to seriously limit the capability of the AFFTC to support existing or anticipated Class II modifications to aircraft.

IMPACT IF NOT PROVIDED: The AFFTC will not be able to provide state-of-the-art support to existing test programs, and will be unable to provide support to future test programs, such as C-17, Advanced Tactical Fighter (ATF), and others.

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1 COMPONENT	FY 1991 R D T & E FACILITIES PROJECT DATA	2 DATE
AIR FORCE (AFSC)		2 AUG 90

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
EDWARDS AIR FORCE BASE, CALIFORNIA	EQUIPMENT INSTALLATION: AVIONICS TEST LAB, BLDG 1870

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
CLASSIFIED	311-115	FSPM902577	500.0

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQ. INSTALL.: AVIONICS TEST LAB, BLDG 1870				500.0
TOTAL PROJECT COST				500.0
EQUIPMENT COST (NON-ADD)				15,000.0
COMPANION PROJECTS:				
902577R: REPAIR BLDG 1870, AVIONICS LAB				200.0
902577C: MINOR CONSTRUCTION, AVIONICS LAB				200.0

10 DESCRIPTION OF PROPOSED RDT&E WORK: Install raised computer floor and dust proof roll-up doors. provide security appropriate for this classified project.

11. REQUIREMENT:

SPECIFIC PURPOSE: Support a classified project that will be occupying Bldg 1870.

PROJECT: Provide installation support for an avionics test lab in Bldg 1870.

REQUIREMENT: A classified project scheduled to occupy Bldg 1870 will require an avionics test lab. This lab will require additional electrical, HVAC, computer and security assets to adequaetly support the equipment installation.

CURRENT SITUATION: Classified areas to test avionics do not currently exist at the AFFTC.

IMPACT IF NOT PROVIDED: Classified avionics will be tested in an unsecure facility, allowing the potential for security leaks, possibly harming the security of the United States.

1 COMPONENT	FY 1992 RDT&E FACILITIES PROJECT DATA	3 DATE
AF (AFSC)		27 July 1990

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
WRIGHT-PATTERSON AFB, OHIO 45433-6503	Equipment Installation of a Cray Computer System, Bldg 676

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
92FFSC	610-711	EQ 92-2208	578.0

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
EQUIPMENT INSTALLATION OF CRAY Y-MP16/16-1024 COMPUTER SYSTEM, BLDG 676	LS			578.0
COST OF COMPUTER EQUIPMENT (NONADD)	LS			(31,080.0)
TOTAL EQUIPMENT AND INSTALLATION COST (NON-ADD)	LS			31,658.0
OTHER NON-ADD COSTS DESIGN COSTS	LS			30.0

10 DESCRIPTION OF PROPOSED CONSTRUCTION

RDT&E INSTALLATION Special Purpose: Consists of site preparation to support the installation of a CRAY computer system with a Solid State Storage Device(SSD), peripheral storage and tape units. Site preparations include the installation of motor generators, power distribution units and associated power wiring; installation of two refrigeration units with water/freon piping and reinforcement of the sub-floor to sustain the equipment loading requirements.

PROJECT: Installation of a Cray Computer System in Building 676 to upgrade local supercomputer processing capability in support of the Aeronautical Systems Division (ASD)/Wright Research and Development Center (WRDC) and NASP missions.

REQUIREMENT: Provide supercomputing support to further and enhance RDT&E and acquisition missions of ASD and WRDC as well as DoD and Air Force DMR 924 direction in support of the Air Force supercomputer initiative. The computer must provide sufficient computational power to meet the research and development needs in the research and technolgy areas represented by the WRDC and ASD System Program Offices. The current growth rate projects the computer system outlined in the attached configuration (Cray Y-MP 16/16-1024).

CURRENT SITUATION: Currently the X-MP/216 computer system provides supercomputer processing capability to support the ASD, WRDC and NASP mission. ASD/SC has been designated by the Defense Management Review Study (DMRD 924) to become one of three primary sites for shared supercomputer resource consolidation. In order to meet this requirment and the requirements of the ASD Research and Development elements a Cray Y-MP16-16-1024 (16 processors and 1024 MW of memory) or equivalent power computer is needed to support the 1992 supercomputing mission.

IMPACT IF NOT PROVIDED: ASD/SC will not be able to support the DMR 924 direction and some mission support projects will experience cost overuns because of the use of commercial service centers for computer processing. Other projects will incur delays due to the limited simulation.

1 COMPONENT	FY 19_91 MILITARY CONSTRUCTION PROJECT DATA	2 DATE
AIR FORCE (AFSC)		6 Feb 91

3 INSTALLATION AND LOCATION	4 PROJECT TITLE
EDWARDS AIR FORCE BASE, CALIFORNIA	SPECIAL TEST FLUID STORAGE/ HANDLING FACILITY, TEMPORARY FAC

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8 PROJECT COST ($000)
11127F			268

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
SPECIAL TEST FLUID STORAGE/HANDLING FACILITY, TEMPORARY FACILITY				
Pre-Engineered Building	LS			90.0
Site Work (Asphalt/Concrete)	LS			40.0
Covered Area	LS			24.0
Fencing	LS			8.0
Alarm System	LS			70.0
SUBTOTAL				232.0
CONTINGENCIES (5%)				11.5
TOTAL CONTRACT COSTS				243.6
SUPERVISION, INSPECTION AND OVERHEAD (10%)				24.4
TOTAL REQUEST				268.0
TOTAL REQUEST (ROUNDED)				268

10 DESCRIPTION OF PROPOSED CONSTRUCTION RDT&E WORK: Pour an asphalt/concrete foundation slab. Fence the area with chain link fence with two access gates 8 ft high and construct a covered storage area to protect the fluid from extreme heat. Construct a pre-engineered metal building with structural frame, roll-up door, containing power and water. Install perimeter lighting. Provide emergency eye wash and shower facilities, equipment with evaporative cooling. Storage area will be equipped with a leakage detection system.

11. PROJECT: Construct a temporary special test fluids storage and handling facility.

REQUIREMENT: Provide adequate temporary space, properly sized and configured to support storage and handling of special test fluids and related support equipment at Edwards Air Force Base. This facility must be capable of providing adequate environment for storage of the fluid while safeguarding both personnel and environment from exposure.

CURRENT SITUATION: There are no facilities of the type described above at Edwards Air Force Base that meet fluid storage and handling requirements. Remote location and security are critical considerations.

IMPACT IF NOT PROVIDED: A critical phase of B-2 aircraft full-scale development testing cannot be accomplished without this facility.

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1 COMPONENT	FY 1991 MILITARY CONSTRUCTION PROJECT DATA	2 DATE
(AFSC) AIR FORCE		27 AUG 1990

3 INSTALLATION AND LOCATION	4. PROJECT TITLE
PETERSON AFB CO	TEMPORARY FACILITY THE CMU SITE ACTIVATION TEAM

5 PROGRAM ELEMENT	6 CATEGORY CODE	7 PROJECT NUMBER	8. PROJECT COST ($000)
0102310F	317-315	ESDS-91-3908*	327.9

9 COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Exterior Utilities:				31.5
Electrical Power Line (15 KV)	LF	410	29.00	(11.9)
Transformer, Pad Mounted (recoverable cost)	KVA	150	94.00	(14.1)
Water (Rigid 2" PVC)	LF	100	10.00	(1.0)
Sanitary (4" Vitreous Clay)	LF	100	31.00	(3.1)
Gas Line	LF	70	20.00	(1.4)
Other Supporting Construction:				20.7
Asphalt Parking (Not a building component or utility)	SP	6	1750.00	(10.5)
Concrete Foundation	SY	46	222.00	(10.2)
Subtotal				52.2
Contingency (5%)				2.6
Total Contract Cost (Funded)				54.8
Facility				273.1
Total Cost				327.9
NOTE: Nonrecoverable costs + disassembly costs < 20% of facility acquisition 1.05($27,600) + $14,000 = $42,980 < $54,600				

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Electric power, water, sanitary connections, parking, and concrete foundation for a facility. Facility includes engineering test processing and analysis areas, a 500 SF classified control room, bathrooms, and handicapped egress. Air conditioning: 10 Tons.

11. REQUIREMENT: 7,400 SF ADEQUATE: 0 SUBSTANDARD: 0
PROJECT: Provide for installation of a 7,400 SF facility for the Cheyenne Mountain Upgrade (CMU) Site Activation Team (SAT) in support of RDT&E.
REQUIREMENT: The building will be used for a short-term requirement (estimated to be 5 years) caused by the transitory peak military mission of the CMU RDT&E program. The 35 member CMU SAT must be located on Peterson AFB, CO in close proximity to the Space Warning System Center (SWSC) facility (Building 1844) to review real-time test data, analyze results, and ensure effective integration and test support of the numerous projects involved in the CMU program.
CURRENT SITUATION: No adequate space exists at Peterson AFB to accomplish the CMU SAT's mission. All existing space is occupied or programmed for occupancy by the time the SAT arrives at Peterson AFB. Leased space in Colorado Springs is too distant from the SWSC facility. Leasing space in Colorado Springs or leasing a relocatable facility at Peterson AFB are more costly options than purchasing a relocatable facility and installing it at Peterson AFB.
IMPACT IF NOT PROVIDED: Inefficient program management and costly expenses to the government would result. Wasted money and time due to traveling between a leased facility in Colorado Springs and the SWSC at Peterson AFB would result if the off-base lease option is selected. Higher costs to the Government would result if the on-base lease option is selected.

*ESDS-91-3908 is the project number assigned by ESD/DE for this project. This number corresponds to RDKA-88-0048, which was assigned by 1003 CES/DE.

1. COMPONENT	FY 1993 RDT&E FACILITY PROJECT DATA (computer generated)	2. DATE
AIR FORCE		[illegible] 1990

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
VANDENBERG AFB, CA	HAVE STARE RADAR SYSTEM

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST($000)
31315F	390-311	ESDS933570	1,223.4

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
HAVE STARE RADAR SYSTEM	LS			819.0
ANTENNA BUILDING	SF	7,000	117	(819.0)
SUPPORTING FACILITIES				275.0
UTILITIES	LS			(30.0)
PAVEMENTS	LS			(15.0)
RADAR SUPPORT STRUCTURE	LS			(200.0)
SITE WORK	LS			(30.0)
SUBTOTAL				1,094.0
CONTINGENCY (5%)				54.7
TOTAL CONTRACT COST				1,148.7
SUPERVISION, INSPECTION AND OVERHEAD (6.5%)				74.7
TOTAL FUNDED COST				1,223.4

10. Description of Proposed Construction: Reinforced concrete mat & wall foundation, structural steel framing, metal siding, 12KV overhead power line, 2" copper water line, asphalt paving, chain link fencing.

11. REQUIREMENT: 7,000 LS ADEQUATE: 0 SUBSTANDARD: 0

PROJECT: Construction of antenna building, radar support structure and miscellaneous and associated supporting utilities to perform a CONUS Test of the HAVE STARE Radar System.

REQUIREMENT: This facility is required in order to perform a CONUS Test of the HAVE STARE Radar System. This facility must provide support for the HAVE STARE Radar System in order to meet program requirements to perform a system test of the radar system prior to shipment and installation at its ultimate location. Facility required for the duration of test.

CURRENT SITUATION: No other radar system, existing or planned, provides the same intelligence gathering information that is provided by this system. A site survey has been performed and existing base facilities are being utilized to the maximum extent.

IMPACT IF NOT PROVIDED: Without this project, the program requirement for a CONUS System Test cannot be met and this program cannot be executed.

ADDITIONAL: CURRENT MISSION 0%; NEW MISSION 100%