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# DEPARTMENT OF THE AIR FORCE

## SUPPORTING DATA FOR FISCAL YEAR 1993 BUDGET ESTIMATES

## SUBMITTED TO CONGRESS JANUARY 1992

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# DESCRIPTIVE SUMMARIES

## RESEARCH, DEVELOPMENT, TEST AND EVALUATION

COPY NUMBER 12 OF 33

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**DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF**
**THE DEPARTMENT OF THE AIR FORCE RESEARCH AND DEVELOPMENT PROGRAM**
**FY 1993 BUDGET ESTIMATES**
**FEBRUARY 1992**

## INTRODUCTION AND EXPLANATION OF CONTENTS

1. (U) GENERAL. This document has been prepared to provide information on the United States Air Force (USAF) Research, Development, Test and Evaluation (RDT&E) program to Congressional committees during the Fiscal Year 1993 hearings. This information is in addition to the testimony given by DOD witnesses.

(U) The Descriptive Summaries provide narrative information to all RDT&E program elements and projects, except those listed in paragraph 4b, within the USAF FY 1993 RDT&E program. The formats and contents of this document are in accordance with the guidelines and requirements of the Congressional committees insofar as possible.

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

(U) Pages 821-830 are presented in response to the requirement contained on page 78 of of the Senate Appropriations Committee report (98-292, 1 November 1983).

(U) The section of the Fiscal Year 1993 Descriptive Summaries entitled "Facilities Exhibits" (pages 841-866) contains information on major improvement to and construction of government owned facilities funded by RDT&E.

2. (U) COMPARISON OF FISCAL YEARS 1991, 1992, AND 1993 DATA. A direct comparison of Fiscal Years 1991, 1992, and 1993 data shown in this document with corresponding data in the Descriptive Summaries dated January 1991 will reveal differences. Many of the differences are attributable to the following factors:

a. (U) Fiscal Year 1992 funding changes as a result of Congressional actionon the appropriation and/or proposed RDT&E reprogramming actions.

b. (U) Fiscal Year 1991 funding changes between October 1, 1990 and September 30, 1991 due to RDT&E reprogramming actions and recissions.

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

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3. (U) RELATIONSHIP OF FISCAL YEAR 1993 BUDGET STRUCTURE TO THE FISCAL YEAR 1992/1993 BUDGET APPROVED BY THE CONGRESS:

| PROGRAM ELEMENT (PE) | | REMARKS |
|---|---|---|
| 0102310F | NCMC - TW/AA Systems | Combined into PE 0305906F in FY 1993. |
| 0102417F | OTH-Backscatter Radar | Program cancelled in FY 1991. |
| 0102423F | Ballistic Missile Early Warning System (BMEWS) | Combined into PE 0305909F in FY 1993. |
| 0102424F | Spacetrack | Combined into PE 0305910F in FY 1993. |
| 0102431F | DSP | Combined into PE 0305911F in FY 1993. |
| 0102432F | SLBM Radar Warning System | Combined into PE 0305912F in FY 1993. |
| 0102433F | NUDET Detection System | Combined into PE 0305913F in FY 1993. |
| 0207316F | Tacit Rainbow | Program cancelled in FY 1991. |
| 0303603F | MILSTAR Satellite Comm System | Combined into PE 0303601F in FY 1993. |
| 0305130F | Consolidated Space Operstions Center | Combined into PE 0305110F in FY 1993. |
| 0305905F | Improved Space Based TW/AA | New PE proposed for FY 1993. |
| 0305906F | NCMC - TW/AA Systems | New PE proposed for FY 1993. |
| 0305910F | Spacetrack | New PE proposed for FY 1993. |
| 0305911F | Space Programs | New PE proposed for FY 1993. |
| 0305912F | SLBM Radar Warning System | New PE proposed for FY 1993. |
| 0305913F | NUDET Detection System | New PE proposed for FY 1993. |
| 0401216F | Airift Mission Activities | New PE proposed for FY 1993. |
| 0603230F | Advanced Tactical Fighter | PE deleted. |
| 0603238F | Global Surveillance/Air Defense/Precission Strike Technology Demonstration | New PE proposed for FY 1993. |
| 0603425F | Advanced Warning System | Combined into PE 0305905F in FY 1993. |
| 0604244F | SRAM II | Program cancelled in FY 1991. |
| 0604245F | SRAM-T | Program cancelled in FY 1991. |
| 0604618F | Joint Direct Attach Munitions | New PE proposed for FY 1993. |
| 0604727F | Joint Standoff Weapons Systems | New PE proposed for FY 1993. |
| 0605856F | Environmental Compliance | New PE proposed for FY 1993. |
| 0605876F | Minor Construction (RPM)-RDT&E | New PE proposed for FY 1993. In PE 0605894F in FY 1992. |
| 0605878F | Maintenance & Repair (RPM)-RDT&E | New PE proposed for FY 1993. In PE 0605894F in FY 1992. |
| 0605894F | Real Property Maintenance - RDT&E | PE deleted. Efforts transferred to PE's 0605896F, 0605856F, 0605876F, and 0605878F in FY 1993. |

4. (U) CLASSIFICATION.

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

Statement A per telecon Jackie Wine
SAF/AQZR
Washington, DC 20330-1000

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| 0101213F | Minuteman Squadrons | 59 | 11 |
| 0208006F | Mission Planning System | 162 | 93 |
| 0603269F | National Aero-Space Plane (NASP) Technology Program | 29 | 421 |
| 0305137F | National Aerospace System (NAS) | 167 | 150 |
| 0604408F | National Launch System | 196 | 658 |
| 0605708F | Navigation/Radar/Sled-Track Support | 205 | 769 |
| 0305165F | Navstar Global Positioning System (GPS) Space/Control | 190 | 175 |
| 0305164F | Navstar Global Positioning System (GPS) User Equipment | 189 | 171 |
| 0305906F | NCMC-TW/AA Systems | 83 | 185 |
| 0604249F | Night/Precision Attack | 110 | 607 |
| 0305913F | Nuclear Detonation (NUDET) Detection System (NDS) | 88 | 210 |
| 0604222F | Nuclear Weapons Support Mission Support | 101 | 551 |
| 0301357F | NUDET Detection System (NDS) | 181 | 104 |
| 0102417F | Over-the-Horizon Backscatter (OTH-B) | 67 | 30 |
| 0207411F | Overseas Air Weapon Control System | 151 | 75 |
| 0602205F | Personnel, Training, and Simulation | 9 | 303 |
| 0603227F | Personnel, Training, and Simulation Technology | 23 | 381 |
| 0101312F | Post Attack Command and Control System | 60 | 18 |
| 0709026F | Productivity, Reliability, Availability, Maintainability (PRAM) | 227 | 834 |
| 0604609F | R&M Technology Insertion Program (RAMTIP) | 197 | 677 |
| 0605101F | RAND, Project Air Force | 202 | 767 |
| 0604735F | Range Improvement | 199 | 719 |
| 0605863F | RDT&E Aircraft Support | 211 | 795 |
| 0605894F | Real Property Maintenance Activity (RPMA) | 214 | 803 |
| 0602302F | Rocket Propulsion and Astronautics Technology | 11 | 312 |
| 0305110F | Satellite Control Network (SCN) | 216 | 135 |
| 0603438F | Satellite Systems Survivability | 192 | 478 |
| 0305912F | Sea Launched Ballistic Missile (SLBM) Radar Warning Systems | 87 | 208 |
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FY 1993 RDT&E DESCRIPTIVE SUMMARY

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

A. (U) RESOURCES ($ in Thousands)

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 001 | B-52H Universal Bomb Bay Adapter (UBBA) Conventional Enhancement | | | | |
| | 0 | 3,942 | 0 | 0 | 3,942 |
| 002 | B-52H HARPOON Conventional Enhancement | | | | |
| | 0 | 0 | 13,300 | 0 | 13,300 |
| Total | 0 | 3,942 | 13,300 | 0 | 17,242 |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
47 B-52Hs are identified to maintain a dual nuclear and conventional mission capability. Reconfiguring the B-52H from a nuclear to conventional mission requires the downloading of the Common Strategic Rotary Launcher (CSRL) and removal of the CSRL mounts. Frequent removal of these mounts damages both the mounts and aircraft attachment points, and is time/manpower intensive. Specific improvements the UBBA modification would accomplish are to cut the CSRL upload/download time and eliminate damage to the aircraft and CSRL mountings during the reconfiguration. A low cost solution to fix the aircraft's reconfiguration requirement is to modify existing internal bomb racks to fit around the CSRL mounts instead of modifying the aircraft's bomb bay and CSRL fittings. Funding also supports the required integration effort of UBBA with HAVE NAP, HARPOON, and Integrated Conventional Stores Management System/MIL-STD 1760 conventional enhancement programs. In addition to the UBBA modification, the program element contains funds for the development of a Stores Management Overlay (SMO) system, new software and Personality Adapter (PA) to enable the B-52H to employ the HARPOON anti-ship missile in support of SAC's maritime collateral mission.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) 001 B-52 Universal Bomb Bay Adapter: Modifies existing bomb racks to allow for reconfiguration of dual tasked B-52H aircraft without damage to the aircraft or CSRL mounts and integrates with the other conventional enhancement programs. Modification involves moving the side beams in on one type of rack and cutting out/beefing up some areas on the other type of rack.

(U) FY 1991 Accomplishments: N/A

(U) FY 1992 Planned Program:
- (U) Funds are required to perform:
  1) Conceptual study to prove design feasibility.
  2) Stress analysis to ensure integrity of the modified bomb racks is still good.
  3) Engineering analysis to integrate with other B-52H conventional enhancement programs.

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

4) Contractor funds to build and check-out the prototype bomb racks.
5) Load testing to determine if SEEK EAGLE recertification will be required for the modified bomb racks.

(U) FY 1993 Planned Program: N/A

2. (U) 002 B-52H HARPOON: As part of the B-52H conventional modification program, thirty B-52Hs will be modified for HARPOON missile carriage in support of theater CINC requirements. Engineering analysis determined that a software intensive modification rather than hardware intensive is the most efficient method to integrate HARPOON and the B-52H. RDT&E funds will develop a Stores Management Overlay (SMO) package, HARPOON Personality Adapter (PA), and test/qualify the prototype software/hardware. Impact of not funding this modification causes SAC to be unable to fullfill its collateral ship interdiction mission.

(U) FY 1991 Accomplishments: N/A

(U) FY 1992 Planned Program: N/A

(U) FY 1993 Planned Program:

- (U) Develop SMO. The SMO integrates with the B-52H Integrated Conventional Stores Management System (ICSMS) and Offensive Avionics System instead of requiring HARPOON specific "black boxes"/wiring for each aircraft. (Note: ICSMS allows new weapons to be interfaced with the aircraft by providing basic software and hardware needed to interface with the aircraft's 1760 data bus. Then each weapon provides its own SMO which ties the aircraft and weapons together.) Uses existing aircraft computers to program, monitor, and launch HARPOON. The SMO will accomplish:
  1) Weapon warm-up, built-in-test, status and alignment.
  2) Safe and in-range calculations, automatic and manual launch and jettison.
  3) Auto/Manual targeting and retargeting.
  4) Fault recording and data reduction.
- (U) Develop, procure material, fabricate (prototype hardware only), lab test and qualify the PA. PAs are required since HARPOON is not a MIL-STD 1760 weapon. PAs are installed on interchangeable aircraft pylons, converting SMO language to HARPOON language.
- (U) Perform electromagnetic interference/compatibility (EMI/EMC) testing.

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

D. (U) Work Performed By: Boeing and OC-ALC/LAHMM.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY: FY 1992 Descriptive Summary reflected projected costs associated with modifying the aircraft's bomb bay to meet the dual conventional/nuclear requirement. By modifying existing bomb racks instead of the aircraft, significant cost reductions for the program were realized. AFLC engineering analysis of the B-52H HARPOON program showed development of SMO/PA vice extensive hardware modifications as the most efficient method to install HARPOON. FY1993 RDT&E funds represent associated nonrecurring development effort for SMO and PA interface between the HARPOON missile and the MIL-STD 1760 data bus.

F. (U) PROGRAM DOCUMENTATION: SAC SON 18-82-R1, August 1987; Draft SAC ORD 18-82-R-1-I-II-III-B, SAC SON 17-82, Jan 83; MOA USN/USAF, Use of the B-52/HARPOON for anti-surface warfare, Jan 84.

G. (U) RELATED ACTIVITIES: Both modification programs support the B-52H conventional upgrade program which gives the B-52H enhanced conventional capabilities.

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands):
(U) Procurement (BA 05):

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 001 B-52H Universal Bomb Bay Adapter Conventional Enhancement | | | | | |
| Cost | 0 | 0 | 0 | 4,200 | 4,200 |
| 002 B-52H HARPOON Conventional Enhancement | | | | | |
| Cost | 0 | 0 | 1,700 | 1,500 | 3,200 |

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

FY 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 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| Major Contract | 45,163 | 17,943 | 15,000 | 15,250 |
| Support Contract | 1,132 | 4,923 | 2,500 | |
| In-House Support | 3,918 | 4,848 | 3,700 | 5,450 |
| GFE/ Other | 1,625 | 845 | 61,100* | |
| **Total** | 51,838 | 28,559 | 82,300 | 20,700 |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | (To Complete) |
| Program Milestones | DAB IIIB | [redacted] | [redacted] | PMRT |
| Engineering Milestones | | | SFTWARE COMP | |
| T&E Milestones | FOT&E I | FOT&E II | | |
| Contract Milestones | FY 90/91 BUY | FY 90/91/ 92 BUY | | COMPLETE DELIVERIES |

* $61.1M FOR TERMINATED VARIANT DEVELOPMENT REMAINS IN BUDGET

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-52H. The Variant, which was terminated by the FY92 Appropriations Conference, was
with extensive commonality to the baseline ACM.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

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

3. (U) FY 1992 Planned Program:
- (U)
- (U) Terminate Variant

4. (U) FY 1993 Planned Program:
- (U) Activate Fairchild AFB with ACM
- (U) Complete software development
- (U) Continue Depot Development

5. (U) Program to Completion:
- (U) Complete FOT&E
- (U) Complete regular ACM Production
- (U) Complete depot activations

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) 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).

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

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

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

2. (U) Schedule Changes: Deliveries began in July 1990. They were subsequently stopped in April 1991 for problems with fuel leaks/odors, water intrusion, wing deployment actuator leak, and overall quality. Missile deliveries were resumed in Nov 1991. The DAB IIIB decision was rescheduled from February 1991 to July 1991. The President directed that the ACM procurement be stopped after the FY92 buy at a total of 640 missiles. Last delivery now expected in FY 94.

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 (640 Missiles)

| | FY1992 Actual | FY1993 Estimate | FY1994 Estimate | To Compl | Total Pgm |
|---|---|---|---|---|---|
| Cost | 516,040 | 0 | 0 | 0 | 3,141,300 |

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 |
| (u) [ ] Demo | Jan 89 | Fully Successful |
| (u) [ ] Demo | Jul 89 | Fully Successful |

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

T&E ACTIVITY (PAST 36 MONTHS - CONTINUED)

| | | | |
|---|---|---|---|
| (U) | Functional Ground Testing | Jun 89 | Completed |
| (u) | [redacted] Measurement | Jun 90 | Completed |
| (U) | Missile Environmental Test | Jul 90 | Successful |
| (U) | MDMSC Free Flights | Sep 90 | 2 of 2 Successful |
| (U) | Dual Source Qualification Test | Dec 90 | Completed |
| (U) | FOT&E (I) Free Flights | Sep 91 | 5 of 6 Successful |
| (u) | [redacted] Measurement | Dec 91 | Completed |
| (U) | FOT&E II First Free Flight | Dec 91 | Successful |

T&E ACTIVITY (TO COMPLETION)

| Event | | Date | Results |
|---|---|---|---|
| (U) | Multifunctional Ground Test | Jul 92 | Ongoing |
| (U) | FOT&E Flight Testing | Feb 92 | Ongoing |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0101142F Project: #2214
PE Title: KC-135 Squadrons Budget Activity: #3-Strategic Programs
Project Title: Improved Aerial Refueling System (IARS)

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| #2214 Improved Aerial Refueling System (IARS) | 3,541 | 12,836 | 16,700 | TBD | 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 Statement Of Need (SON) 001-87 which identified several deficiencies in the KC-135 refueling capability. The LARS 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 improve the efficiency and effectiveness of tactical aircraft employment and deployment and enhance interoperability with Naval and NATO aircraft.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Planned Program:
   - (U) Determine if the air refueling mission can be accomplished without a navigator
   - (U) Study fuel panel improvements
   - (U) Conduct inflight evaluation of improved boom nozzles

2. (U) FY 1992 Planned Program:
   - (U) Determine requirements that should be considered in selecting future tanker aircraft
   - (U) Conduct evaluations of systems that could improve the cargo carrying capability of the KC-135
   - (U) Study improvements that could be made to the air refueling boom to increase the size of the air refueling envelop.
   - (U) Complete the corrosion control study which will identify methods to extend the airframe service life
   - (U) Release the Multipoint Refueling Request For Proposal (RFP).

Program Element: #0101142F Project: #2214
PE Title: KC-135 Squadrons Budget Activity: #3-Strategic Programs

3. (U) FY 1993 Planned Program:
   - (U) Determine requirements that should be considered in selecting future tanker aircraft
   - (U) Conduct evaluations of systems that could improve the cargo carrying capability of the KC-135
   - (U) Evaluate aircraft subsystem that are candidates for replacement based upon Reliability and Maintainability factors
   - (U) Conduct wing mounted pod design studies and development of prototypes
   - (U) Increase over FY92 is needed to continue the Engineering Manufacturing Development (EMD) for the multipoint refueling program

4. (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. For the Multipoint, Preliminary ground integration testing of Group A and B Kits and Modify KC-136R with development Group A Kit.

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

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: There have been no major changes

2. (U) SCHEDULE CHANGES: There have been no significant schedule changes in the IARS R&D program

3. (U) COST CHANGES: Change in FY92 funding is due to the Congressional reduction of $2.0 million. In addition, the multipoint refueling program start has been slipped. The Request for Proposal will be released in late FY92. The R&D phases is scheduled for 30 months

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)
- (U) Multipoint Refueling Statement Of Need (SON) has not been validated by AF/XOR.

G. (U) RELATED ACTIVITIES: None

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

Program Element: #0101142F Project: #2214
PE Title: KC-135 Squadrons Budget Activity: #3-Strategic Programs

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: France has a program to place wing mounted refueling pods on their KC-135R aircraft. Boeing is the prime contractor for the French program. The French have approached the U.S. to see if we would be interested in a data sharing agreement. A Data Sharing Agreement does not require the expenditure of funds.

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. The Multipoint Refueling program schedule calls for 30 month R&D program. The schedule will be finalized after approval of the Mission Need Statement.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

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

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Rapid Execution and Combat Targeting | 85,713 | 41,917 | 17,160 | 0 | 245,209 |
| Reentry Systems Launch Program | -- | 7,777 | 8,520 | Cont | TBD |
| Minuteman Long Range Planning | 0 | 3,963 | 3,020 | Cont | TBD |
| Minuteman III Advanced Guidance Program | -- | -- | -- | TBD | TBD |
| Total | 85,713 | 53,676 | 28,700 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT:

The Rapid Execution and Combat Targeting (REACT) Program was initiated in 1988 to respond to a need to improve missile combat crews' ability to receive, process, and implement National Command Authority emergency war orders. The program combines five related efforts into one to improve the maintainability, supportability, responsiveness and operability of the weapon system: *Weapon System Control Element* (WSCE) replacement, Rapid Message Processing (RMP), rapid retargeting, Launch Control Center (LCC) console integration, and Missile Procedures Trainer (MPT) computer replacement. The program will modify Minuteman and Peacekeeper LCCs and associated trainers.

The Reentry Systems Launch Program (RSLP) provides mission planning, payload integration, launch support, booster storage, maintenance and logistics support for DoD Research and Development launches. RSLP was established in 1972 as a result of a Secretary of Defense request to establish a single agency that provides launch vehicle support to DoD. Prior to FY92, funds for maintaining this capability were provided by the primary users including the Air Force Advanced Strategic Missile Systems (ASMS) program and the Army Strategic Defense Command. Starting in FY92, the Air Force's share for maintaining the RSLP launch vehicle support capability was provided as part of the Minuteman Squadrons program element (thus qualifying it as a new start). Costs directly attributable to a specific launch or program are paid by the users (Air Force, Navy, Army, Strategic Defense Initiative Organization, etc.). The funds also support deactivation of MMII by providing storage of the assets and their conversion for future DoD test needs.

The Minuteman Long Range Planning task is to examine Minuteman subsystem modification options required to meet SAC and AFLC objectives for operability, supportability and maintainability. Options are evaluated for implementation, schedule, and cost issues. This line becomes critical in FY92 and beyond because the Advanced Strategic Missile Systems (ASMS) program office mission changed from a "6.3b," ICBM weapon system specific application to a "6.3a," advanced development mission. As a result, the funds can no longer be applied to specific weapon system requirements development. Minuteman Long

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

Range Planning funds will support ICBM long range planning and system specific tasks previously funded by ASMS.

The Minuteman III guidance set (NS-20) requires replacement due to degradation similar to that exhibited in the Minuteman II guidance set. This program replaces/upgrades the NS-20 in a two phased approach. The first phase will start with contract award in FY93 and designs new guidance system electronics external to the inertial measurement platform that will be compatible with both the existing inertial measurement platform and an advanced Inertial Platform. The second phase, which begins in FY95, will develop an Advanced Inertial Platform and integrate the system electronics for use in a Minuteman III. In FY92 and FY93, this program will be funded out of PE64312F, ICBM Modernization. Starting in FY94 and beyond, this program will be funded out of PE 11213F, Minuteman Squadrons.

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

1. (U) Reentry Systems Launch Program (RSLP)

(U) FY 1991 Accomplishments:
- (U) Provided all hardware, launch services and range support for 8 launches. Delivered 14 rocket motors to support several other launches for different agencies
- (U) Prepared six bunkers at Pueblo Army Depot for temporary storage of deactivated Minuteman II rocket motors.
- (U) Prepared a Request for Proposal (RFP) procurement package for source selection (new contracts) of the Multiservice Launch System (MSLS).

(U) FY 1992 Planned Program:
- (U) Research, develop, acquire, store and maintain test launch vehicles, motors, components, facilities and capabilities in support of projected government user requirements.
- (U) Provide necessary supplemental storage requirements and capabilities for deactivated Minuteman II flight test assets at non-AFLC facilities.
- (U) Award contracts and initiate development of MSLS test launch vehicle(s) that can meet the projected range, payload and accuracy requirements needed to support future Air Force and DoD flight test requirements.

(U) FY 1993 Planned Program:
- (U) Research, develop, acquire, store and maintain test launch vehicles, motors, components, facilities and capabilities in support of projected government user requirements.
- (U) Provide necessary supplemental storage capabilities for deactivated Minuteman II flight test assets at non-AFLC facilities.
- (U) Continue development of MSLS test launch vehicle(s) that can meet the projected range, payload and accuracy requirements needed to support future Air Force and DoD flight test requirements.

(U) Work Performed By: Boeing provides facility maintenance and ICBM launch services for RSLP. Orbital Sciences Space Data Division provides the ICBM "front section," payload deployment system, sounding rocket hardware integration and launch services. TRW provides systems engineering and targeting support. Rockwell (Autonetics) provides guidance and control technical support. An Architectural and Engineering contractor for the Arizona Air National Guard is preparing drawings for modification of existing storage bunkers and facilities for MMII storage at Navajo Army Depot. Subsequent contracts will be awarded to accomplish the

modifications. OO-ALC will modify transportation and handling equipment as needed and BMO will award contracts to procure additional handling equipment. Pueblo Army personnel will assist with temporary storage of MMII third stages at Pueblo Army Depot until Navajo modifications are complete. Additionally, a contractor will be chosen to develop the Multiservice Launch System (MSLS). MSLS is a flexible series of "front section" components, including off-the-shelf guidance and control, to accommodate a variety of DoD mission requirements.

(U) Related Activities:
(U) RSLP provides support for Air Force Ballistic Missile Technology, Army Strategic Defense Command, Strategic Defense Initiative Organization, and other DoD programs on a reimbursable basis.

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

(U) International Cooperative Agreements: Not Applicable.

2. (U) Minuteman Long Range Planning:

(U) FY 1991 Accomplishments:
- (U) No funds appropriated in FY91.

(U) FY 1992 Planned Program:
- (U) Convert radiographic fault detection data for non-destructive test and evaluation into data consistent with currently installed computed tomography hardware.
- (U) Support ICBM Long Range Planning (ILRP).
- (U) Evaluate and define interface requirements for existing Ballistic Missile Technology guidance efforts for possible use as Minuteman Pre-Planned Product Improvement (P3I).
- (U) Evaluate emerging "clean" propellants for use in MMIII stages II/III repour, scheduled to begin in the late 90s. The goal is to reduce the cost to manufacture and dispose of propellant and significantly reduce environmental impact during static and flight test operations.
- (U) Build a System Threat Assessment Report (STAR) spanning the projected service life of MMIII.

(U) FY 1993 Planned Program:
- (U) Provide a work station for initial screening, tagging, and historical review through electronic media of solid rocket motor faults identified by computed tomography. Provide capability for the work station to include the new 16 MeV scanner scheduled for implementation.
- (U) Support ICBM Long Range Planning (ILRP).
- (U) Evaluate advanced Operational Support Equipment (OSE) including replacement power converters and Launch Facility electrical designs for reduced power consumption and implementation of modern solid state electronics.
- (U) Continue evaluation of emerging "clean" propellants for use in MMIII stages II/III repour, scheduled to begin in the late 90s.

(U) Work Performed By: Ballistic Missile Organization (BMO/MY) is the responsible agency for this program.

(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.

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

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

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

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

| Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| REACT | 85,713 | 41,917 | 17,160 | 0 | 245,209 |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Minuteman Launch Control Centers (LCCs) have been deployed since the early 1960's. Since the original deployment, numerous communications and weapon system modifications have been installed on a stand-alone basis without consideration for the human engineering interfaces and space limitations of the Minuteman LCC. Additional communications requirements and changes in crew procedures have, over time, resulted in task saturation of the crew members. AFLC studies show that the Weapon System Control Element (WSCE) is also reaching the end of its useful life. Manufacturers do not produce many replacement parts anymore and current memory capacity has reached its limits. The Rapid Execution and Combat Targeting (REACT) program was initiated in 1988 to correct these concerns. The program combines five related efforts into one to improve the maintainability, supportability, responsiveness and operability of the weapon system: Weapon System Controller (WSC) hardware replacement, Rapid Message Processing (RMP), rapid retargeting software, Launch Control Center (LCC) console integration, and Missile Procedures Trainer (MPT) computer replacement. The program will modify Minuteman and Peacekeeper LCCs and associated trainers. The new WSC provides significantly increased system capacity and eliminates supportability difficulties presented by the current aging WSCE. The RMP element and rapid retargeting will streamline current procedures and provide greater flexibility for crew members responding to critical National Command Authority directives. The new console with dual workstations meets the Congressional requirement for console commonality between Minuteman and all other LCCs. The MPT modification will reflect current operational configurations and allow crew members to receive maximum benefit from training time.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Began REACT (Minuteman and PIMS configurations) Critical Design Reviews (CDRs).
   - (U) Continued developmental testing.
   - (U) Delivered nine Engineering Models (EMs)
   - (U) Ballistic Missile Organization (BMO) conducted sole source selection and awarded contract for WSCE production. Electronic Systems Division (ESD) exercised their first option for production of the REACT Communications Element. Occurred in Jul and Sep 1991, respectively.

2. (U) FY 1992 Planned Program:
   - (U) Complete Critical Design Reviews (CDRs).
   - (U) Conduct functional and physical configuration audits (FCA/PCA) of the REACT Communications Element.
   - (U) Complete targeting software FCA/PCA.
   - (U) Begin system level integration testing and weapon system testing.
   - (U) Complete hardware/software qual test of AM LCC configuration

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

- (U) Complete installation of REACT modification of AM Test Bed at Hill AFB.
- (U) Exercise first WSCE production option for an additional 29 sites.

3. (U) FY 1993 Planned Program:
   - (U) Conduct WSCE hardware/software FCA/PCAs.
   - (U) Conduct maintainability demonstration.
   - (U) Obtain nuclear certification of REACT software.
   - (U) Begin Initial Operational Test and Evaluation (IOT&E).
   - (U) Begin pathfinder installation and checkout of test site at VAFB.
   - (U) Complete first installation and conduct technical acceptance demonstration of Missile Procedures Trainer (MPT).
   - (U) Complete depot activation
   - (U) Begin weapon system installation and checkout leading to First Asset Delivery (FAD) in 4Q FY93.
   - (U) Exercise second WSCE production option for an additional 20 sites.

4. (U) Program to Completion:
   - (U) Achieve Last Asset Delivery (LAD) in *2Q FY95.

   * FY93 ABES decision extended production one year and deferred procurement of all Peacekeeper LCCs (5 LCCs, 2 Test Units) to FY94. Impact to LAD currently estimated at nine months (From 2Q FY95 to 1Q FY96).

D. (U) WORK PERFORMED BY: Loral Command and Control Systems (formerly Ford) was awarded the Weapon System Control Element (WSCE) portion of the REACT contract, overseen by Ballistic Missile Organization (BMO). 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 1992 DESCRIPTIVE SUMMARY:
1. (U) TECHNICAL CHANGES:AEPDS (related program) cancelled Dec 91. BMO and SAC reevaluating requirement for Rapid Message Processing (RMP) and also investigating alternative concepts for RMP. Decision expected Spring 92.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None.

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 (Revised), Rapid Execution and Combat Targeting, 15 Apr 91.

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 (RMP) timeline requirements in the SAC SORD. Since AEPDS was terminated in Dec 91, SPO and SAC are reevaluating requirement for RMP and also investigating alternative concepts for RMP. Decision expected Spring 92.

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

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

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 86,762 | 127,800* | 92,000 | 53,800 | 360,362 |

* Note: $12.0M of the $127.8M is contained in PE 35145F, Arms Control for single RV software modifications required by START

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

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. | (U) Full Scale Development (FSD) contract award | Apr 1989 |
| 2. | (U) System Design Review (SDR) | Jul 1989 |
| 3. | (U) Preliminary Design Review (PDR) | Mar 1990 |
| 4. | (U) Critical Design Review (CDR) | Mar 1991 |
| 5. | (U) Production Contract Award (WSCE) | Jul 1991 |
| 6. | (U) First Asset Delivery (FAD) | Sep 1993 |
| 7. | (U) Last Asset Delivery (LAD) | **2Q FY95 |

**FY93 ABES decision extended production one year and deferred procurement of all Peacekeeper LCCs (5 LCCs, 2 Test Units) to FY94. Impact to LAD currently estimated at nine months (From 2Q FY95 to 1Q FY96).

FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: 0 10 13 12F Budget Activity: #3 - Strategic Programs
PE Title: Post Attack Command and Control System

A. (U) RESOURCES ($ IN THOUSANDS)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3069 | Post Attack Command and Control System | | | | |
| | 1267 | 1301 | 2100 | Cont | TBD |
| Total | 1267 | 1301 | 2100 | 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 crisis. 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, Pacific Command, and the National Emergency Airborne Command Post.

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

(U) Project Number, Project Title: WWABNCP EMP Surveillance Program

(U) The WWABNCP Systems 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.

1. (U) FY 1991 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 FY 92 system test.

2. (U) FY 1992 Planned Program:

- (U) Complete major systems test.
- (U) Conduct hardness maintenance/hardness surveillance.

- (U) Continue survivability/vulnerability analysis of acquisition and modification programs.
- (U) Analyze FY 91 test data and identify corrective actions.
- (U) Set up Hardness Review Board.

3. (U) FY 1993 Planned Program:

- (U) increase in funding is due to additional EMP testing.
- (U) Initiate corrective actions based on the FY 91 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) 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 #0 10 13 16F - Strategic Air Command Communications.
- (U) Program Element #0303 60 1F - Air Force Satellite Communications.
- (U) Program Element #030 20 15F - National Emergency Airborne Command Post .
- (U) Program Element #0303 13 1F - Air Force Support to the Minimum Essential Emergency Communications Network.
- (U) Program Element #0303 603F - Milstar.
- (U) Program Element #0 10 2433F - Nuclear Detonation Detection System.
- (U) Program Element #0 604 711F - System Survivability.
- (U) Program Element #0 604 747E - 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.

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

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3769 | Combat Mission Folder | | | | |
| | 0 | 3785 | 7500 | Cont. | TBD |
| 3854 | Combat Mission Folder | | | | |
| | 3678* | 0 | 0 | 0 | 0 |
| Total | 3678 | 3785 | 7500 | Cont. | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT:

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.

The recent reorganization of Air Force force structure and strategies requires changing the relevant program names to more accurately reflect program objectives. The Nuclear Mission Planning and Production System (NMPPS) program and Block 1 of that program are now titled Mission Data Preparation System (MDPS). NMPPS Block II is now the Combat Mission Folder (CMF) program and part of the Air Force Mission Support System (AFMSS). NMPPS Block III will be part of the AFMSS.

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

(U) Combat Mission Folder (CMF): Project provides required increases in aircrew response capability through the automated generation of mission materials necessary for mission accomplishment, the safety of flight, and combat flexibility. This system answers bomber requirements not found in the common Air Force mission planner. All but $2.0M of research and development (R&D) funds are for CMF development. The project provides for the transition of MDPS functions to the common Air Force Mission Support System. This fusion of mission planning systems is scheduled to accommodate bomber systems in 1995. R&D funds of $2.0M are budgeted to support the integration effort. The overall objective is to ensure that mission essential programs can be economically accommodated within STRATCOM's War Planning ADP. Using and increasing the capability of common automated hardware and software architecture will facilitate interoperability and decrease the total acquisition costs for future weapon systems.

*Funds transferred to Project 3769 in FY92 and subsequent years.

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

(U) FY 1991 Accomplishments:
- (U) Completed CMF engineering definition, developed A-spec and began software design engineering requirements analysis with SAC.
- (U) Completed plan for fielding a deployable capability during late FY92. Involves MDPS and CMF integration with SAC shelters by SAC and SM-ALC.

(U) FY 1992 Planned Program:
- (U) Fuse MDPS with the AFMSS system.
- (U) Begin contract action for an automated mission material production capability (the CMF) that will generate the necessary bomber combat crew maps and flight plans within four hours at the unit level.
- (U) Begin evolutionary transfer of MDPS to AFMSS.

(U) FY 1993 Planned Program:
- (U) Increase in funding is required to meet constricted schedule of the planned CMF/AFMSS Block C contract award.
- (U) Perform AFMSS system design for converting MDPS capabilities to AFMSS.
- (U) Acquire AFMSS Block B workstations to support CMF integration effort.

(U) Work Performed By: The programs discussed here are managed by the Director of Mission Planning Systems, Electronic Systems Division, Hanscom AFB, MA. A contract including CMF will be competed in 4th Qtr FY92 for award in 2nd Qtr FY93.

(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) This effort is being conducted in conjunction with the Air Force Mission Support Systems (AFMSS) (PE #0208006F). There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

| Appropriation | FY 1991 | FY 1992 | FY 1993 | To Complete | Total Program |
|---|---|---|---|---|---|
| 3080 | 5900 | 16100 | 15600 | Cont. | TBD |

- (U) The funds shown above are as of 1 Feb 92. Funds for FY 1994 to FY 1999 were included in the SAC POM input. These funds are provided by SAC to the ESD program office.

(U) International Cooperative Agreements: Not Applicable

FY 1993 RDT&E DESCRIPTIVE SUMMARY

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

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2976 Joint Surveillance System Connectivity | 947 | 3,958 | 700 | Cont | TBD |
| 2996 FAA/AF Radar | 993 | 4.469 | 4.200 | Cont | TBD |
| TOTAL | 1,940 | 8,427 | 4,900 | 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 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 communications capabilities.

(U) FY 1991 Accomplishments:
- (U) Awarded contract for Advanced Interface Control Unit (AICU)

(U) FY 1992 Planned Program
- (U) Conduct AICU System Testing
- (U) Install and integrate AICU, Block A at 4 CONUS Sector Operation Control Centers (SOCC's)
- (U) Study/prototype atmospheric connectivity improvements
- (U) Improve capability for Joint Tactical Information Distribution System (JTIDS) to integrate with the AICU via the Modular Tactical Air Control Center (MTACC).
- (U) Integrate TPS-70 radar at Mt Kokee Hawaii into Hawaiian Region Operation Control Center (ROCC).

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

(U Work Performed By: Management of the Joint Surveillance System Connectivity is by the Electronic Systems Division of Air Force Systems Command, Hanscom AFB, MA. Air Force Program Management for the JSS Region and Sector Operations Control Centers is by Air Force Logistics Command, Wright-Patterson AFB, OH. The prime contractor for the JSS ROCCs/SOCCs is Hughes Aircraft Company, Fullerton, CA.

(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 1991 | FY 1992 | FY 1993 | To | Total |
|---|---|---|---|---|

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

| | Actual | Estimate | Estimate | Complete | Program |
|---|---|---|---|---|---|
| Cost | 20,026 | 11,167 | 17,561 | 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 reimburseable basis as 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 1991 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 1992 Planned Program:
- (U) Continue contractor system engineering support for FARR JPO.
- (U) Support site preparation, radar production, installation, test and system checkout.

(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) 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 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 1991 | FY 1992 | FY 1993 | To | Total |
|---|---|---|---|---|

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

| | Actual | Estimate | Estimate | Complete | Program |
|---|---|---|---|---|---|
| Cost | 54,522 | 53,926 | 41,270 | Cont | TBD |

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

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

A. (U) Resources ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2980 North Atlantic Defense System (NADS) | 6,610 | 10,556 | 7,100 | Cont | TBD |
| 3159 Caribbean Basin Radar Network (CBRN) | 907 | 1,240 | 1,300 | Cont | TBD |
| TOTAL | 7,517 | 11,796 | 8,400 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element funds strategic air defense improvements in the North Atlantic and the Caribbean.

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

1. (U) 3159 Caribbean Basin Radar Network (CBRN): Provides for the deployment of transportable and fixed site three-dimensional ground radar systems and associated C3I capabilities in the Caribbean Basin. CBRN is intended to provide a security shield, promote regional cooperation, and contribute to the antidrug initiative through integration of new and existing radars into the surveillance network.

(U) FY 1991 Accomplishments:
- (U) Completed radar testing in Honduras
- (U) Delivered radars at Dominican Republic, Colombia and Panama
- (U) Delivered initial command center capability to Panama

(U) FY 1992 Planned Program:
- (U) Deliver radar at Honduras
- (U) Complete radars at Colombia, Caymen Islands and Costa Rica
- (u) Award contracts for two [redacted] radars and command center

(U) FY 1993 Planned Program:
- (u) Complete [redacted] radars and command center
- (U) Complete integration of host nation radars

(U) Work Performed By: Efforts are managed by 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) CBRN track information is sent to the Joint Surveillance System, PE #0102325F.
- (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: All funds are transferred from DOD Counternarcotics Account, Project Number 4207, PE 12446D.

(u) International Cooperative Agreements: Host Nation Agreements (HNA's) are pursued in connection with each planned CBRN site. HNA's have been signed with Honduras, Columbia, Dominican Republic, Cayman Islands and Costa Rica.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

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

A. (U) Resources ($ in Thousands)

| Project Title / Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| North Atlantic Defense System (NADS) | 6,610 | 10,556 | 7,100 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Provides improvements to command, control and communications (C3) and surveillance equipment in the North Atlantic required to correct air defense deficiencies in the strategically important Greenland-Iceland-Norwegian (G-I-N) gap. Radars and Control and Reporting Center (CRC) improvements are NATO Infrastructure funded. US funds cryptographic capabilities and systems engineering and integration activities for the total program per US-Iceland MOU.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Installed first NATO radar in Iceland and started DT&E
- (U) Expanded AWACS connectivity with upgraded HF data links
- (U) Continued development on NATO Control/Reporting Center (CRC)

(U) FY 1992 Planned Program:
- (U) Install and integrate NATO Radars in Iceland
- (U) Continue development of CRC
- (U) Provide remote rekeying system to enable unattended operation of remote sites. This effort is jointly funded by AF and NSA.

(U) FY 1993 Planned Program:
- (U) Continue development of CRC
- (U) Install CONUS software support facility
- (U) Perform development testing on radar and CRC subsystems.

(U) Program to Completion:
- (U) Deliver fully operational and supportable system to operator
- (U) This is a continuing program

D. (U) Work Performed By: Efforts are managed by Electronic Systems Division, Hanscom AFB, MA. Technical support is provided by MITRE Corporation, Burlington, MA; Electromagnetic Compatibility Analysis Center, Annapolis, MD. General Electric, Syracuse, NY, is the contractor for the radar subsystem. Hughes Aircraft & Company, Fullerton, CA, is the contractor for the CRC/Communications subsystem.

E. (U) COMPARISON WITH FY 1992/1993 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: No change
2. (U) SCHEDULE CHANGES: No change
3. (U) COST CHANGES: Minor funding changes do not impact program content.

F. (U) PROGRAM DOCUMENTATION:

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

- (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) NADS track information is sent to the Joint Surveillance System, PE #0102325F.
- (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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 5,038 | 475 | 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. US funds cryptographic capabilities and systems engineering and integration activities for the total program per US-Iceland MOU.

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. | (U) First Iceland NATO Radar (INR) Turnover | FY 1993 |
| 2. | (U) Final NATO CRC Turnover | FY 1996 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0102412F Budget Activity: #3-Strategic
PE Title: DEW Radar Stations

A. (U) Resources ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2710 North Warning System | 1,023 | 2,242 | 2,600 | 18,871 | 153,667 |

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 FY 1993:

1. (U) Project Number and Title: 2710 North Warning System (NWS): A combination of minimally-attended, long-range (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 1991 Accomplishments:
- (U) Awarded production contract for UAR program.
- (U) Installed LRR at BAR-M Alaska.

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

(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 Engineering and Manufacturing Development contractor for the UAR and overall systems engineering. UNISYS Corporation was selected in FY91 as the production contractor for the UAR and overall systms engineering. This contract was awarded as a follow-on to

Program Element: #0102412F Budget Activity: #3-Strategic
PE Title: DEW Radar Stations

design technical competition. 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 6,729* | 7,590 | 0 | 0 | 476,782 |
| Quantities | | | | | |
| UAR Controllers | 0 | 0 | 0 | 0 | 5 |
| Short Range Radar | 0 | 0 | 0 | 0 | 37 |
| Communications Equip | 0 | 2 | 0 | 0 | 2 |

* FY91 is for spares funding

(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 1993 RDT&E DESCRIPTIVE SUMMARY

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

A. (U) Resources ($ in Thousands)

| Project Title / Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| OTH-B | 9,402 | 0 | 0 | 0 | 417,256 |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program acquires an Over-the-Horizon Backscatter (OTH-B) radar that satisfies requirements for tactical early warning of an atmospheric attack on North America. The OTH-B was shown through OT&E testing to detect and track airborne vehicles at all altitudes to ranges between 500 and 1800 nautical miles. The radar system is presently operating in limited operations on the East Coast Radar System (ECRS) and is in caretaker maintenance on the West Coast Radar System (WCRS).

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

1. (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. In FY 1992, Congress eliminated RDT&E funding for this program.

(U) FY 1991 Accomplishments:
- (U) Completed IOT&E on ECRS
- (U) Completed Operations Capability Demonstration on WCRS

(U) FY 1992 Planned Program:
- Program terminated by Congressional direction.

(U) FY 1993 Planned Program:
- None

(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. Technical efforts, analysis, engineering studies and support were provided by: Rome Laboratories, Griffiss AFB, NY; MITRE Corporation, Bedford, MA; and the Phillips Laboratories, Hanscom AFB, MA.

(U) Related Activities:
- (U) OTH-B sends track information to the Joint Surveillance System, PE #0102325F and to the NORAD Air Defense Operations Center.
- (U) Communications are 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)

None - FY 1991 (BA 63) rescinded.

(U) International Cooperative Agreements: None.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2962 F-111 Avionics Modernization Program (AMP) | 5,277 | 6,616 | 2,878 | 625 | 132,245 |
| 3079 F-111 Digital Flight Control System (DFCS) | 3,988 | 5,826 | 7,022 | 0 | 65,009 |
| 13323A F-111 Crew Escape Module Parachute Replacement | 1,950 | 7,731 | 0 | 0 | 9,681 |
| 19302B F-111 Stores Management System | 0 | 9,600 | 19,300 | 10,500 | 39,400 |
| | 11,215 | 29,773 | 29,200 | 11,125 | 246,335 |

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-111E,F and EF model aircraft 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 FY 1993:

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 1991 Accomplishments:
- (U) SRU TPS development.
- (U) Further LRU TPS development commenced LRU TPS Independent Validation and Verification (IV&V).
- (U) Commenced IV&V for AIS-R.

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

(U) FY 1993 Planned Program:
- (U) Commence warranty testing.

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

(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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 2,300 | 3,600 | 7,900 | 0 | 911,700 |

(U) International Cooperative Agreements: Not applicable.

2. (U) Project 3079, Digital Flight Control System (DFCS): The DFCS is a permanent safety modification that replaces the electronic portion of the F/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 673 hours.

(U) FY 1991 Accomplishments:
- (U) Delivery of LRIP units for kit-proofing on the affected models of F-111 aircraft.
- (U) Commenced development of the Maintenance Training Set (MTS).

(U) FY 1992 Planned Program:
- (U) Complete development of the Maintenance Training Set (MTS).
- (U) Start testing on EF-111A aircraft.

(U) FY 1993 Planned Program:
- (U) Complete development on TPSs.
- (U) Complete testing on EF-111A aircraft.
- (U) Resolve service reports from kit proofing and EF-111A flight test

(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.

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

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

Aircraft Procurement (3010) Funds:

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 21,300 | 28,000 | 4,600 | 0 | 56,400 |

(U) International Cooperative Agreements: None.

3. (U) Project 13323A, F-111 Crew Excape Module Parachute Replacement: A permanent 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 1991 Accomplishments:
- (U) Award contract for development, test, and integration effort.
- (U) Commenced development testing.

(U) FY 1992 Planned Program:
- (U) Complete development testing
- (U) Complete qualification testing

(U) Work Performed By: The Escape Module Modification parachute contractor is Irvin Industries, Inc., Santa Ana, CA. The development effort is managed by the F-111 System Manager located at Sacramento Air Logistics Center, McClellan AFB, CA.

(U) RELATED ACTIVITIES: The parachute program requires the installation of an impact attenuation bag which will be installed concurrently with the parachute. The impact attenuation bag is a time change item, procurred with stock funding, requiring changout in FY 93. 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 4,600 | 4,000 | 0 | 0 | 8,600 |

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element : #0207129F
PE Title: F-111 Squadrons
Project Number: 1930
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| F-111 Stores Management System (SMS) | 0 | 9,600 | 19,300 | 10,500 | 39,400 |

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-111E/F. 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 1991 Accomplishments: Not applicable.

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

3. (U) FY 1993 Planned Program:
   - (U) Continue Full Scale Development
   - (U) Critical Design Review.
   - (U) Fabricate 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 February, 1992.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: Schedule changes are due to delay in release of Request for Proposals.
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. Resultant force structure drawdown necessitated the re-programming of FY 93 funds to FY 93-96 in order to accommodate acceptable MDS operational out of service rates during modification installation.

F. (U) PROGRAM DOCUMENTATION:

- (U) Tactical Air Command Configuration Control Board Approval, 11 May 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) Procurement (3010) Funds:

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 0 | 0 | 53,100 | 53,100 |

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

J. (U) MILESTONE SCHEDULE:

| | |
|---|---|
| 1. (U) Contract award | Jul 92 |
| 2. (U) Preliminary Design Review | Feb 93 |
| 3. (U) Critical Design Review | Jul 93 |
| 4. (U) Flight test | Jul 94 - Oct 95 |
| 5. (U) Kitproof | Oct 94 - May 95 |
| 6. (U) Production install | Sep 95 - Jul 00 |

FY 1993 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)

| Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| A-10 Improved Data Modem (IDM) System | 0* | 12,719 | 0 | 0 | 16,671 |

* Funding deleted by Congress pending decision made on follow-on Close Air Support (CAS) aircraft. That decision was made in the 26 Nov 90 Milestone IV CAS Defense Acquisition Board (DAB).

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

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments: (Funded with FY 90 IDM dollars and a Joint Program Office Global Positioning System [GPS] contribution for the shared Control Display Unit [CDU].)
   - (U) Second Incremental Design Review on IDM (Oct 90)
   - (U) Award Contract Engineering Task (CET) for Integration Phase I (CET Award thru Critical Design Review).
   - (U) Prime contractor award to subcontractor for the Control Display Unit (CDU).
   - (U) Complete overall system design.
   - (U) Complete software design requirements.
   - (U) Begin software, hardware mod, and hot bench design.
   - (U) Complete Preliminary Design Review (PDR).
   - (U) Prime contractor award to subcontractor for aircraft integration.

2. (U) FY 1992 Planned Program:
   - (U) Complete Critical Design Review (CDR).
   - (U) Receipt of IDM as government furnished equipment (GFE) from F-16 SPO.
   - (U) Complete development of CDU.
   - (U) Complete group A kit development.
   - (U) Complete software, hardware mod, and hot bench design.
   - (U) Award CET for Integration Phase II (CDR thru commencement of dynamic simulation).
   - (U) Complete software code and test.
   - (U) Complete hot bench integration and fabrication.

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

- (U) Award CET for Integration Phase III/IV (dynamic simulation testing thru QOT&E).
- (U) Dynamic simulation testing.
- (U) Complete 2 prototype kits and begin install (trial).
- (U) Flight test support.
- (U) Deliver level III reprocurement data package.
- (U) Complete technical documentation validation.

3. (U) FY 1993 Planned Program: Program completes with FY92 funding.

4. (U) Program to Completion: Not Applicable .

D. (U) WORK PERFORMED BY: IDM integration is on contract with the Charles Stark Draper Laboratory, Inc., Cambridge, MA. The contract is being managed by Sacramento Air Logistics Center (SM-ALC), McClellan AFB, CA.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Not applicable.
2. (U) SCHEDULE CHANGES: FY91 funding deletion slips development completion to FY93 (no additional funding).
3. (U) COST CHANGES: Not applicable.

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) 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-I/II-A, System Operational Requirements Document (SORD) Short Range Data Communication for Close Air Support and Defense Suppression, HQ TAC/DRCA, 3 Oct 91.(S)
- (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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 0 | 0 | 93,700 | 93,700 |

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

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 | Aug 91 |
| 7. | (U) Receipt of IDM (GFE) | Dec 91 |
| 8. | (U) CDR | Dec 91 |
| 9. | (U) Hot bench testing | Jul 92 |
| 10. | (U) Dynamic simulation/integration | Nov 92 |
| 11. | (U) Prototype/Trial installation (#1) | Nov 92 |
| 12. | (U) QT&E | Mar 93 |
| 13. | (U) QOT&E | Jul 93 |
| 14. | (U) Prototype/Trial installation (#2) | May 93 |
| 15. | (U) Level III data delivery | Jul 93 |
| 16. | (U) Contract award (Mod Kits) | Mar 94 |
| 17. | (U) First article | Jun 95 |
| 18. | (U) Kit proof delivery | Sep 95 |
| 19 | (U) Kit proof (1) | Feb 96 |
| 20. | (U) Production kit delivery (169 kits) | Nov 96-Nov 97 |
| 21. | (U) Production kit installs | Feb 97-Feb 98 |

FY 1993 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 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| Major Contract | 13,606 | 146,000 | 171,300 | 871,003 |
| Support Contract | 555 | 0 | 0 | 0 |
| In-House Support | 10,388 | 8,600 | 8,800 | 37,308 |
| GFE/ Other | 1,816 | 3,699 | 3,700 | 15,589 |
| Total | 26,365 | 158,299 | 183,800 | 923,900 |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | (To Complete) |
| Program Milestones | N/A | N/A | N/A | N/A |
| Engineering Milestones | Blk 40/MLU. Integration | Blk 50/MLU/CAS Integration | MLU/CAS On-goingIntegra. | MLU/CAS On-going Integra |
| T&E Milestones | IPE Phase III Testing | Blk 50 Integration | On-going Testing | On-going Testing |
| Contract Milestones | Initiate MLU EMD | Continue MLU Initiate CAS/BAI EMD | Continue MLU & CAS/BAI | Initiate 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 CAPABILITIES:

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, mostly single-seat, multirole tactical fighter with full air-to-air and air-to-surface combat capabilities. It is employed in a complementary role to the F-15 in counter-air missions and as a primary aircraft in the surface attack role. It replaces aging F-4s and modernizes 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), aerial refueling probe and drogue 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 Block 30 F-16C/D aircraft. To continue to meet the increased threat of the 1990's a Mid-Life Update (MLU) of the F-16A/B aircraft avionics will be conducted in concert with our European partners. In response to a continued requirement for a real time tactical reconnaissance capability to replace the aging RF-4, the USAF will conduct a retrofit modification of F-16C/D aircraft to perform a reconnaissance role using the Advanced Tactical Air Reconnaissance System (ATARS), sensor suite and associated avionics upgrades.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Initiated MLU EMD program.

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

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

3. (U) FY 1993 Planned Program:
   - (U) Continue EMD for CAS/BAI and MLU retrofit programs.
     -- (U) Complete design review and continue MMC development.
   - (U) Initiate studies and analysis for Follow-on Multirole Fighter program.

4. (U) Program to Completion:
   - (U) Complete EMD of MLU and CAS/BAI retrofit kits.
   - (U) Initiate EMD for a follow-on multirole fighter program.
   - (U) Conduct F-16 peculiar modifications related to reconnaissance sensor mechanization.

D. (U) Work Performed By: The F-16 System Program Office of the Aeronautical System Division (ASD), Wright Patterson Air Force Base, OH, has implemented a single manager organization as a selected program under the Integrated Weapon System Management (IWSM) program initiative. The F-16 Program Office has management responsibility for the total F-16 program including the F-16 A/B program which had previously transfered to Ogden Air Logistics Center (Air Force Logistics Command) Hill Air Force Base, UT. The F-16 System Support Director at Ogden Air Logistics Center is directly responsible to the F-16 Systems Program Director for overall acquisition logistics planning and sustaining system support. 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 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: $16.5M reductions in FY92 ($9M from MMC, $3.35M from MLU, $2.5M from 30MM Gun Pod and $1.679M from several smaller efforts). $82.3M in FY93 moved from aircraft procurement (F-16 mods) to RDT&E in support of the MMC.

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) TAF SON 28 Dec 78.
   - (U) F-16C/D TEMP, 1 Mar 91.

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

- (U) TAF 303-76: F-16 SORD for the F-16 Block 50, 5 Aug 91
  F-16 SORD for the F-16 Block 40, 16 Jul 91
  F-16 SORD for the A-16, 3 Jan 90 (being updated)
- (U) TAF 302-87-1/11-A: SORD for Follow-on Manned Reconnaissance System, 21 Mar 90
- (U) Milestone IV ADM, CAS, 28 Nov 90

G. (U) RELATED ACTIVITIES:
- (U) PE #0604249F, Night/Precision Attack.
- (U) PE #0602127F, ATARS (F-16R)
- (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 (BP10 & BP16)*:

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 2,128,853 | 1,243,565 | 717,109 | 203,758 | 34,931,800 |
| Quantity | 108 | 48 | 24 | 0 | 2189 |

* (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 Governments (EPGs) 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 and Microwave Landing Systems. 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 FY88 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. EMD was originally scheduled to begin on 2 Jan 91, but was delayed to 3 Jul 91, pending full EPG authorization. USAF RDT&E funding ($107M) for EMD has been budgeted to cover the 5-year EMD period. The Production phase of the program is scheduled to begin in early 1996, with kit deliveries to commence in late 1999 and continue through early 2003.

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, ADF AIM 120 capability, AIM-7 capability, SEEK EAGLE & FMS OFP tests. |
| F-16C/D (MSIP) DT&E | Nov 82 to present | Airframe, and avionics testing related to Blk 30, 40, 50 improvements. Blk 30 software update 1 completed Aug 91, Blk 40 Tape 3 completed Aug 91, BLK 50 tape 1 completed Dec 91. |
| F-16C/D FOT&E | Jun 85 to present | Blk 40 IOT&E completed 30 Oct 89. Continued Blk 30 software update 1 & Blk 40 tape 3 testing. |

T&E ACTIVITY (TO COMPLETION)

| Event | Planned Date | Remarks |
|---|---|---|
| F-16A/B Improvements | Jan 92 to Feb 92 | Continue tests on software updates for OFP & RADAR, SEEK EAGLE & PGU 28/B (improved 20mm round) |
| F-16C/D (MSIP) | Jan 92 to Feb 95 | 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 IOT&E | Currently Inactive | Each major subsystem testing will depend on its development schedule. |
| F-16C/D FOT&E (AMRAAM, ALR-56M, ALE-47, LANTIRN, GPS & RLG) | Continuing | Continue Tactical Air Command testing of Blk 40/42/50/52 subsystems |

FY 1993 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 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| ($000) | | | | |
| Major Contract | 24,589 | 73,100 | 27,100 | 21,700 |
| Support Contract | 12,194 | 10,100 | 5,800 | 200 |
| In-House Support | 29,621 | 28,425 | 21,100 | 74,200 |
| GFE/ Other | 0 | 0 | 3,300* | 0 |
| Total | 66,404 | 111,625 | 57,300 | 96,100 |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | To Complete |
| Program Milestones | N/A | N/A | N/A | N/A |
| Engineering Milestones | Ongoing Integration | Ongoing Integration | Ongoing Integration | |
| T&E Milestones | Nuclear Cert Flt Test | Follow-on Weap Integ Flt Test | Ongoing Upgrades | Ongoing Upgrades |
| Contract Milestones | F-15 IPE Integration Complete | 1st VHSIC Equipped A/C Del | LANTIRN Integ Complete | N/A |

* FY 1993 INCLUDES $3.3M FROM PE 0207130F

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 of the F-15C and adds systems, such as LANTIRN, 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 1991 Accomplishments:
   - (U) Initiated studies and analyses necessary to assure successful F-15 post-production support and continued efforts required to achieve F-15 organic depot activation.
   - (U) Continued development and testing of the improvements initiated in FY 1990 and prior.
   - (U) Completed IPE integration and continued Vertical Tail redesign study.
   - (U) Started RF Compatibility, Ground Collision Warning System (GCWS), and Standard Flight Data Recorder (SFDR) integration efforts.
   - (U) Started Probe and Drogue aerial refueling integration study.
   - (U) Continued 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.

2. (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, and LANTIRN enhancements/integration.
   - (U) Initiate development of the Down-Sized Tester to replace obsolete and unsupportable F-15A-E avionics intermediate test stations, integration of GPS, development/integration of Digital Mapping System (DMS), and development/integration of peculiar software for the Air Force Mission Support System (AFMSS).
   - (U) Complete vertical tail redesign study.
   - (U) Complete probe and drogue study.
   - (U) Implemented Integrated Weapon Systems Management Approach for the F-15A-E which will result in a "cradle to grave" single program director for the weapon system.
   - (U) Continue post production studies and analyses and activities to attain organic depot activation.

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

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

3. (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, SFDR, and GPS, DMS, Down Sized Tester and AFMSS integration.
   - (U) Initiate implementation of post-production support activities for the F-15A-E.

4. (U) Program to Completion:
   - (U) Complete tasks including SEEK EAGLE, TEWS integration, advanced algorithm ECCM and combat ID improvements, GCWS design, SFDR integration, and GPS integration, DMS integration Down Sized Tester and AFMSS integration.

D. (U) Work Performed By: The F-15E development is being managed by the F-15 System 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 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Initiation of DMS efforts, AFMSS efforts.
2. (U) SCHEDULE CHANGES: Start of GPS integration effort delayed until 1QFY92. Start of TEWS baseline OT&E delayed until 1QFY93.
3. (U) COST CHANGES: FY 91 program reduced $500K for PEO reprogramming; funds available due to restructuring of the GPS program. FY92 reduced $7.0M by Congress for the Down Sized Tester.

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 SORD, Jul 91.
   - (U) F-15E TEMP, Mar 90.

G. (U) RELATED ACTIVITIES:
   - (U) The TEWS for F-15 application is being developed in PE 0604270F.
   - (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) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

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

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 3010 Weapon System | | | | | |
| 1,302,300 | 2,158,000 | 773,500 | 11,500 | 9,500 | 25,718,200 |
| Initial Spares | | | | | |
| 189,000 | 51,000 | 29,600 | 28,100 | 63,700 | 1,958,500 |

- (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 |
| First APG-70/AMRAAM Launch | Nov 90 | Direct Hit |
| F-15E SRAM-T Early Vibration Flight Test | Mar 91 | Completed |
| ALR-56C/ALQ-135 Band 3 Integration | Jan 91 | Ongoing |
| MSOGS OT&E | Aug 91 | Completed |
| VHSIC DT&E (Start) | Jul 91 | Ongoing |
| First APG-70 Dual AMRAAM Launches | Sep 91 | Two direct Hits |
| F-15E TEWS Baseline Development Test | Sep 91 | Started |

T&E ACTIVITY (TO COMPLETION)

| Event | Planned Date | Remarks |
|---|---|---|
| F-15E TEWS Baseline OT&E (Start) | 1Q FY93 | TAWC, China Lake |
| VHSIC OT&E | 2Q FY92 | 6510TESTW, Edwards AFB |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207136F
PE Title: Manned Destructive Suppression of Enemy Air Defenses
Project Number: 3777
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ In Thousands)

| Project Title: Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Manned Destructive Suppression of Enemy Air Defenses (MDSEAD) | | | | | |
| F-15E | 0 | 4,954 | 8,800 | 293,246 | 307,000 |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This element provides funds for the development and procurement of the Air Force's MDSEAD capability. The AGM-88 High-Speed Anti-Radiation Missile (HARM) is the primary munition for SEAD. The project provides the F-15E aircraft the capability to carry and employ the HARM. The F-15E aircraft will be modified with Radio Frequency (RF) Precision Direction Finding (PDF) capability necessary for HARM targeting. This effort will be followed by an internal PDF effort for the F-16 aircraft starting at the end of the FYDP.

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

1. (U) Project: 3777, F-15E HARM TARGETING:

(U) FY 1991 Accomplishments: (FY 1990 funds)
- (U) Identified changes in F-15E Weapons computer required to launch HARM.
- (U) Initiated efforts to incorporate HARM on the F-15E.
- (U) Continued system concept studies/evaluation.
- (U) Continued program Pre-Phase I documentation requirements.
- (U) Outdoor Antenna/Multipath Testing on F-15E Mockup.

(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) Initiate efforts to minimize duplication of PDF efforts for the F-15E and F-16.
- (U) Start HARM Integration and Risk Reduction.
- (U) Start PDF Demonstration and Validation.

(U) FY 1993 Planned Program:
- (U) F-15E Early Vibration Flight Test.
- (U) PDF antenna studies.
- (U) Competitive PDF Prototypes.
- (U) Start EMD efforts on F-15E HARM Carriage.

(U) Program to Completion:
- (U) Start PDF EMD in FY 94.
- (U) Start F-15E HARM captive carry/jettison launch testing in FY 95.
- (U) Start F-15E PDF Developmental Testing and Evaluation in FY 96.
- (U) Start F-15E PDF Operational Testing in FY 98.
- (U) Full rate production starts in FY 99.

Program Element: #0207136F
PE Title: Manned Destructive Suppression of Enemy Air Defenses

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

- (U) PDF installed in first F-15E Squadron in FY 00.

(U) Work Performed By: Air Force Systems Command, Aeronautical Systems Division, F-15 Program Office, Wright-Patterson, AFB, OH, is responsible for development. McDonnel Douglas, St. Louis MO, is the expected primary contractor for the F-15E HARM Carriage and PDF efforts. General Dynamics, Ft. Worth, TX, is the expected primary contractor for the F-16C PDF efforts. Texas Instruments, Lewiswille, TX, produces the HARM.

(U) RELATED ACTIVITIES:

(U) PE-0207126F (High-Speed Anti-Radiation Missile).
(U) PE-0207134F (F-15E Squadrons).
(U) PE-0207133F (F-16 Squadrons).
(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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207141F
PE Title: F-117A Squadrons

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ In Thousands)

| Project Number / Project Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| F-117A | 35,496 | 64,130 | 1,300 | 2,500 | 2,035,658 |

B. (U) BRIEF DESCRIPTION OF ELEMENT: 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 FY88, 59 aircraft were procured; the last aircraft was delivered to Tactical Air Command in Jul 90. Two squadrons are operational with the 37th Fighter Wing at Tonopah Test Range, NV.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Continued development and testing to support aircraft software and Mission Data Planning System updates.
   - (U) Conducted F-117A environmental testing at Eglin AFB, FL.
   - (U) Began development for incorporation of Ring Laser Gyro / Global Positioning System (RLG/GPS).
   - (U) Continued development and began flight testing of Infrared Acquisition and Designation System (IRADS) upgrade.

2. (U) FY 1992 Planned Program:
   - (U) Continue development and testing to support aircraft software and MDPS updates.
   - (U) Continue development and testing of a RLG/GPS navigation system.
   - (U) Complete development and testing of IRADS upgrade.

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

3. (U) FY 1993 Planned Program:
   - (U) Complete development and testing of a RLG/GPS navigation system.

4. (U) Program to Completion:
   - (U) FY94 ($2.5M) is the last year planned for RDT&E for the F-117A program. Trade studies to be conducted on potential application of more advanced ordnance applications to F-117A.

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 Infrared Acquisition and Designation System.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: As a direct result of the DESERT STORM operations, Tactical Air Command added GPS as a requirement for upgrade to the current SPN/GEANS inertial navigation system (previously it was ring laser gyro required only). Funding became available during the FY92 budget cycle from a Congressional plus up to allow incorporation of GPS into the aircraft.

2. (U) SCHEDULE CHANGES: Incorporation of GPS, which was originally scheduled to begin in the outyears (FY98), has now been moved forward and will be completed by FY97.

3. (U) COST CHANGES: Congress increased the RDT&E budget by $42.0M during the FY92 budget cycle as a direct result of the operations conducted during DESERT STORM. Funding was increased to provide improvements for the F-117A avionics systems to include addition of GPS and a faster Mission Data Planning System.

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)

| FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|
| 100,230 | 198,644 | 146,184 | Cont | TBD |

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

(U) Military Construction

| FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|
| 36,000 | 60,600 | 0 | 0 | 392,000 |

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 |
| 9. (U) IRADS upgrade Complete | Oct 1995 |
| 10. (U) RLG/GPS installation complete | Mar 1996 |

FY 1993 *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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| AIM-9 | * 0 | * 0 | 34,600 | 228,600 | 281,800 |

* Funded in FY 91 and 92 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 the requirement for incremental improvements to the AIM-9[

- (U) Incremental improvements in missile seeker, fuze, and kinematics 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 program, a near term, low cost modification to the USN and USAF inventory AIM-9M missiles. It addresses[

] This missile modification is required as soon as possible[

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) USN and USAF signed Memorandum of Agreement (MOA) establishing a Joint SRM Program Office at PMA-259 with USN as executive Service. FY 91 and 92 funds placed in OSD account and transferred to Joint Office. Funding for the AIM-9X RDT&E effort is shared 50-50 with the USN.

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) Began development of draft Joint Operational Requirements Document (JORD) and concept definition for AIM-9X.
- (U) Naval Weapons Center (NWC) China Lake began design and initial test of AIM-9M-8/9.

2. (U) FY 1992 Planned Program:
   - (U) Complete draft JORD and continue concept definition of candidates for AIM-9X.
   - (U) Prepare AIM-9X seeker demonstration/validation (Dem/Val) documentation. Dem/Val phase will be parallel government/contractor efforts to minimize risk by evaluating a minimum of two technical approaches.
   - (U) Begin design verification testing for the AIM-9M-8/9 and initial engineering for production of new circuit boards.

3. (U) FY 1993 Planned Program:
   - (U) Finalize AIM-9X JORD and complete concept definition. Award competitive AIM-9X seeker Dem/Val contracts.
   - (U) Complete design verification testing and engineering for AIM-9M-8/9 production hardware. Award production contract.

4. (U) Program to Completion:
   - (U) Complete AIM-9X seeker Dem/Val (FY 95) and award contract for Engineering and Manufacturing Development (FY 95).
   - (U) Develop for AIM-9X, a kinematically improved airframe and warhead/fuze. Improvements will 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 all AIM-9X development activities under the provisions of the USAF/USN MOA. Concept definition will be conducted by the Naval Weapons Center China Lake with USAF participation. The seeker Dem/Val will be accomplished by defense contractors under management of the Joint Office.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Concept definition was restructured and the completion date was moved from FY 92 to the 3rd quarter FY 93. As a result, contract award for seeker Dem/Val and subsequent milestones were adjusted accordingly.

Program Element: #0207161F Budget Activity: #4 - Tactical Programs
PE Title: Tactical Air Intercept Missile (AIM)

3. (U) COST CHANGES: Total program RDT&E funds increased due to program restructure from the Air Force unique AIM-9M upgrade to the Joint Service AIM-9 program, which includes the near-term AIM-9M-8/9 and the long-term AIM-9X.

F. (U) PROGRAM DOCUMENTATION:
- (U) Memorandum of Agreement for Short Range Air-to-Air Missile Programs (U), dated 9 Oct 90.
- (U) Joint Operational Requirements Document for an AIM-9M Short Range Missile Update (S), dated 22 Oct 91

G. (U) RELATED ACTIVITIES:
- (U) Program Element #0604354N, AAM Systems Engineering (USN RDT&E)
- (U) Program Element #0603715D, AIM-9 Consolidated Program (OSD Account)
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense. The Joint Tactical Air-to-Air Missile Oversight Committee and Steering Group provide executive level monitoring of SRM activities.
- (U) Joint Potential Designator: Joint

H. (U) OTHER APPROPRIATION FUNDS ($ in Thousands):
(U) Procurement: (Missile Procurement, BA 4, P-1 Line Item 19)

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| AIM-9M-8/9 | 0 | 871 | 11,681 | 62437 | 74,989 |

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

J. (U) MILESTONE SCHEDULE:
- (U) Begin Joint Service design verification testing for the AIM-9M-8/9 — 1 Qtr FY 92
- (U) Let contract for AIM-9M-8/9 modification kit production — 1 Qtr FY 93
- (U) Complete AIM-9M-8/9 design verification testing — 1 Qtr FY 93
- (U) Let contract for competitive AIM-9X seeker Dem/Val — 3 Qtr FY 93
- (U) Complete AIM-9X concept definition — 3 Qtr FY 93
- (U) Complete AIM-9X seeker Dem/Val — 2 Qtr FY 95
- (U) Award contract for engineering manufacturing development of AIM-9X seeker, kinematically improved airframe, and improved warhead — 3 Qtr FY 95
- (U) Award AIM-9X low-rate initial production contract — 4 Qtr FY 99
- (U) Deliver first article AIM-9X seeker — 1 Qtr FY 01

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| AMRAAM P3I | 17,953 | 30,285 | 35,400 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The AMRAAM P3I program provides for a continuing research and development program which maximizes its compatibility with advanced fighters, enhances the missile's capability and operational flexibility against mid-1990's and beyond threats, incorporates high payoff technology developments, and investigates new variants and/or alternate missions that can utilize many of the baseline missile's attributes. The Air Force and Navy developed the baseline AMRAAM in response to an urgent US and NATO Tactical Air Forces need. This operational deficiency required a high performance, all weather, missile to counter existing air vehicle threats operating at high or low altitude and having advanced electronic countermeasures capabilities.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Initiated engineering and manufacturing development (EMD) of the P3I Phase 1 program. Includes compressed carriage missile design to increase number of AMRAAMs carried on the F-22 and improves the AMRAAM electronic counter-countermeasure (ECCM) capabilities to counter existing and emerging threats
   - (U) Conducted the System Design Review for the P3I Phase I program
   - (U) Completed early wind tunnel testing and selection of the wing and fin planforms for the compressed carriage design
   - (U) Initiated ECCM and processor growth study to address requirements driven by future threats

2. (U) FY 1992 Planned Program:
   - (U) Continue development of improvements begun in FY 1991
   - (U) Initiate an engineering study to address advanced propulsion requirements
   - (U) Conduct Preliminary Design Review for P3I Phase 1 program
   - (U) Continue wind tunnel tests of compressed carriage missile

3. (U) FY 1993 Planned Program:
   - (U) Continue development of improvements begun in FY 1991
   - (U) Conduct Critical Design Review for P3I Phase 1 program
   - (U) Provide for proof-of-design/manufacturing (POD/POM) hardware for subsystem testing, missile integration and system level testing

4. (U) Program to Completion:
   - (U) Initiate Phase 2 development (ECCM software and warhead/fuzing improvements) in FY 1994

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

- (U) Complete Phase 1 development in FY 1995
- (U) Define and pursue additional changes in areas such as propulsion, ordnance, guidance, and ECCM required to enable the missile to counter the evolving threat
- (U) This is a continuing program

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 development effort. A cost plus contract was awarded to Hughes with Raytheon as a major subcontractor. Production competition will be retained.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: None
3. (U) COST CHANGES: The FY 1993 increase of $4.2 million is due to repricing of the Phase 1 effort and deferred work from prior years (+$5.7 million), and reductions for inflation, Defense Business Operations Fund, and FY 1992 Congressional action (-$1.5 million). Total increase of Phase 1 is $20.6 million. The "To Complete" and "Total Program" estimates are not appropriate due to the continuing nature of the P3I program and have been removed.

F. (U) PROGRAM DOCUMENTATION:

| | | | |
|---|---|---|---|
| - MENS | Nov 78 | TEMP | Nov 90 |
| - SOC | Jul 86 | DCP | Mar 91 |
| - SORD | Jan 90 | JSOR (USAF ROC 9-76) | May 91 |
| - STAR | Jun 90 | | |

G. (U) RELATED ACTIVITIES:

- (U) AMRAAM integration with the following programs:
  Program Element #0207130F, F-15
  Program Element #0207134F, F-15E
  Program Element #0207133F, F-16
  Program Element #0604239F, F-22
  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: Joint

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

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

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| PE 0207163F, AMRAAM | | | | | |
| Cost | 618,298 | 532,372 | 731,396 | 4,761,175 | 9,650,641 |
| Quantity | 510 | 630 | 1015 | 7588 | 12000 |

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

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| PE 0207590F, SEEK EAGLE | | | | | |
| Cost | | | | 38,799 | 43,466 |
| Quantity | | | | 77 | 89 |
| TOTAL | | | | | |
| Cost | 618,298 | 532,372 | 731,396 | 4,799,974 | 9,694,107 |
| Quantity | 510 | 630 | 1015 | 7665 | 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 withdrew from the Family of Advanced Air-to-Air Weapons Memorandum of Understanding (MOU) between the Federal Republic of Germany (GE), the United Kingdom (UK), and the United States (US). The US and UK utually agree that the MOU is terminated due to UK failure to complete the ASRAAM program (lack of funding). Sales of AMRAAM to the UK, Germany, Turkey, and South Korea will be by Foreign Military Sales procedures.

J. (U) MILESTONE SCHEDULE:

| | |
|---|---|
| 1. (U) Milestone IIIA (Low Rate Initial Production) | June 1987 |
| 2. (U) Award AMRAAM P3I EMD Contract | March 1991 |
| 3. (U) Milestone IIIB Review | May 1991 |
| 4. (U) Initial Operational Capability | September 1991 |
| 5. (U) Full Rate Production Approval | March 1992 |
| 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 |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3201 | Tactical Air Reconnaissance System (TARS) | | | | |
| | 30,041 | 13,570 | 1,858 | 3,700 | 187,919 |
| 3364 | Joint Service Imagery Processing System (JSIPS) | | | | |
| | 14,900 | 6,000 | 5,300 | 2,800 | 118,898 |
| 3792 | F-16R | | | | |
| | 0 | 35,699 | 48,442 | 9,000 | 93,141 |
| Total | 44,941 | 55,269 | 55,600 | 15,500 | 399,958 |

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Follow-On Tactical Reconnaissance System (FOTRS) is an umbrella tactical reconnaissance improvement effort. The program's objective is to meet our tactical commanders' requirement for timely imagery intelligence information. FOTRS will replace the current film-based imaging and wet-film processing systems with a digital imaging and processing system capable of providing real-time/near-real-time tactical reconnaissance information. FOTRS development consists 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 USAF portion of ATARS consists of two development projects: Project 3201, Tactical Air Reconnaissance System (TARS), and Project 3792, a reconnaissance capable F-16C titled the F-16R. TARS focuses on the full scale development of digital electro-optical and infrared sensors, datalink, recorders, and management system. The F-16R project will develop a tactical reconnaissance pod and modify existing F-16s to provide "hands-on, heads-up" cockpit reconnaissance controls. The USAF will integrate TARS into a reconnaissance pod for carriage on the F-16R. A single TARS sensor, either day or night sensor, will be the payload on the USAF, USN, and USMC Unmanned Aerial Vehicle-Medium Range (UAV-MR). The USMC F/A-18D(RC) will carry TARS sensors on a pallet which is interchangeable with the gun pallet. JSIPS is known as Project 3364. JSIPS, a joint-Service effort, focuses on the development of a ground station capable of receiving, processing, exploiting, and disseminating multi-sensor tactical imagery (EO/IR/radar) from Air Force, Navy, and Marine Corps manned and unmanned systems. The USAF will use a Mission Verification System (MVS) at the unit level for training feedback and verification of sensor suite performance.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

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

Project: # 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 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| Major Contract | 25,842 | 7,600 | 1,000 | 2,200 |
| Support Contract | 1,280 | 4,270 | 0 | 0 |
| In-House Contract | 1,500 | 900 | 858 | 1,500 |
| GFE/ Other | 1,419 | 800 | 0 | 0 |
| Total | 30,041 | 13,570 | 1,858 | 3,700 |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | To Complete |
| Program Milestones | N/A | Rebaseline Program | N/A | LRIP & MSIII |
| Engineering Milestones | Hardware Deliveries | Hardware Deliveries | N/A | N/A |
| T&E Milestones | RF-4C CFT | RF-4C DT&E F/A-18D(RC) DT | RF-4C OA F/A-18D(RC) OT | F-16R DT/IOT&E UAV-MR Multi-Service OT&E |
| Contract Milestones | N/A | N/A | N/A | Prod Thru FY05 |

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

Project: # 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 tactical reconnaissance systems. The Air Force will integrate the sensor suite into a reconnaissance pod for the F-16R. Also, either a day or night TARS sensor, with supporting subsystems, will be the reconnaissance payload for 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 a sensor validation test bed in support of F/A-18D(RC), F-16R, and UAV-MR integration testing.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) RF-4C contractor flight testing began on 27 Feb 91.

2. (U) FY 1992 Planned Program:
   - (U) Rebaseline program.
   - (U) TARS DT&E using the RF-4C.
   - (U) Begin TARS DT&E using the F/A-18D(RC).

3. (U) FY 1993 Planned Program:
   - (U) TARS Operational Assessment using the RF-4C.
   - (U) TARS Operational Testing using the F/A-18D(RC).

4. (U) Program to Completion:
   - (U) Reconnaissance pod/TARS certification testing.
   - (U) Podded F-16R DT&E/IOT&E.
   - (U) TARS Low Rate Initial Production (LRIP) and MS III decision.
   - (U) TARS/Unmanned Aerial Vehicle-Medium Range (UAV-MR) Multi-Service OT&E.

D. (U) WORK PERFORMED BY: The prime contractor for the Tactical Air Reconnaissance System (TARS) development is Martin-Marietta Corporation (MMC), Orlando FL. 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 |
| Loral Fairchild Systems | Syosset, NY | EO Sensors |
| LIRIS | Lexington, Ma | IR Line Scanner |
| Datatape | Pasadena, Ca | Digital Tape Unit |
| UNISYS | Salt Lake City, Ut | Data Link |
| Computing Devices | Hastings, UK | Management System |

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

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY

1. (U) TECHNICAL CHANGES: The airborne digital tape recorder manufacturing and assembly methods were revised in response to scanner head reliability and producibility problems identified during Contractor Flight Testing (CFT). The main electronics unit and the medium-altitude electro-optical sensor were redesigned to meet F/A-18D(RC) weight and volume criteria.

2. (U) SCHEDULE CHANGES: CFT began on 27 February 1991. Delays in hardware deliveries have extended the CFT period, requiring a reevaluation of achievable program milestone dates. To this end, the program office is working a revised baseline. Initial indications are that the Low Rate Initial Production decision may slip to FY94 in order to complete the required testing to support such a decision.

3. (U) COST CHANGES: Cost impacts associated with the slip in the program will be included in the baseline revision. FY91 and beyond program funding adjustments are a result of schedule slips.

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, 4 Mar 91
- (U) USAF/USN Memorandum of Agreement on Unmanned Air Reconnaissance Vehicle.

G. (U) RELATED ACTIVITIES:

- (U) PE 030514D, DOD Joint Unmanned Air Vehicle Program.
- (U) PE 0207133F, F-16.
- (U) PE 0204136N, F/A-18.
- (U) PE 0207213F, EO Long Range Oblique Photography (EO LOROP).
- (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, BA05/06/07):

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 10,060 | 50,190 | 435,076 | 495,326 |
| Qty | | | | | |
| Sensors | 0 | 0 | 20 | 85 | 105 |
| Pods | 0 | 0 | 20 | 118 | 138 |
| Kits | 0 | 0 | 20 | 130 | 150 |

Note: Also reflected under Project 3792, F-16R.

(U) Military Construction: Not applicable.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None. However, a number of NATO and non-NATO countries interested in TARS have requested Price and Availability (P&A) data.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

| Event | Date | Results |
|---|---|---|
| Contractor Flight Test | 27 Feb 91 | Day, Low Altitude Electro-Optical (LAEO) Sensor, Successful |
| Contractor Flight Test | 28 Jun 91 | Day, LAEO & Infrared Linescanner (IRLS), Successful |
| Contractor Flight Test | 2 Jul 91 | Day, LAEO & IRLS, Unsuccessful - Circuit Breaker/Instrumentation |
| Contractor Flight Test | 10 Jul 91 | Night, IRLS, Successful |
| Contractor Flight Test | 9 Sep 91 | Day, LAEO, IRLS, & Data Link to Spectrum Analyzer, Successful - LAEO needs work in forward imaging regime |
| Contractor Flight Test | 9 Oct 91 | Day, LAEO & IRLS, Successful |

T&E ACTIVITY (TO COMPLETION)

| Event | Date | Remarks |
|---|---|---|
| DT&E Start | FY4/92 | RF-4C Government Flight Test |
| DT Start | FY4/92 | F/A-18D Government Flight Test |
| OA Start | FY 93 | RF-4C |
| OT Start | FY 93 | F/A-18D(RC) |
| MOT&E Start | FY 95 | UAV-MR |

FY 1992 RDT&E DESCRIPTIVE SUMMARY

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

Project: #3364
Budget Activity: #4 - Tactical Programs

Project Title: Joint Service Imagery Processing System

POPULAR NAME: JSIPS

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

| Budget | FY 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| ($000) | | | | |
| Major Contract | 11,200 | 4,210 | 3,760 | 1,400 |
| Support Contract | 2,400 | 850 | 790 | 1,250 |
| In-House Contract | 1,300 | 290 | 250 | 150 |
| GFE/ Other | 0 | 650 | 500 | 0 |
| Total | 14,900 | 6,000 | 5,300 | 2800 |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | To Complete |
| Program Milestones | N/A | III National JSIPS | N/A | III Tactical JSIPS & MVS |
| Engineering Milestones | Hardware Deliveries | Integrate Tactical Input Segment | N/A | N/A |
| T&E Milestones | Began National JSIPS Accreditation | National JSIPS Accredited Tactical JSIPS DT&E | Multi-Service OT&E (MOT&E) Tactical JSIPS & MVS | JSIPS Support for TARS-equipped Platforms |
| Contract Milestones | Restructure Complete | N/A | N/A | Continue Prod Thru FY02 |

Program Element: #0207217F
PE Title: Follow-On Tactical Reconnaissance System
Project: # 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, exploiting, and disseminating, in softcopy or hardcopy, digital imagery. JSIPS will replace the costly and manpower/logistics intensive Photo Processing and Interpretation Facilities (PPIFs) associated with the RF-4C. JSIPS can be configured in one of three ways: National Receive Segment; Tactical Receive Segment; or National and Tactical Receive Segments. JSIPS will meet the Tactical Commander's need for timely and responsive imagery for the detection, location and classification of tactical targets. The tactical JSIPS will support USAF, USN, and USMC manned and unmanned reconnaissance vehicles carrying the Tactical Air Reconnaissance System (TARS) sensor suite.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:

- (U) Defined USN JSIPS shipboard requirements and USAF Mission Verification System (MVS) requirements.
- (U) JSIPS contract restructure completed.
- (U) US Army system accreditation began.
- (U) Completed altitude chamber/environmental/mobility testing on Softcopy Exploitation, System Support, and Communication/Exploitation Support Segments.

2. (U) FY 1992 Planned Program:

- (U) National JSIPS MS III decision.
- (U) Complete Tactical Input Segment integration.
- (U) Begin DT&E of Tactical JSIPS at Eglin AFB, Fl.
- (U) Begin DT&E of MVS at Eglin AFB, Fl.

3. (U) FY 1993 Planned Program:

- (U) Begin Multi-Service OT&E of Tactical JSIPS.
- (U) Complete DT&E of MVS.
- (U) Begin and complete OT&E of MVS.
- (U) Continue to support testing of TARS-equipped platforms.

4. (U) Program to Completion:

- (U) USMC/USAF Tactical JSIPS MS III decision.
- (U) Milestone III decision for MVS.
- (U) Continue to support testing of TARS-equipped platforms.

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 Testing |

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

Project: # 3364
Budget Activity: #4 - Tactical Programs

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: The delay in Tactical Air Reconnaissance System (TARS) sensor suite hardware deliveries for testing have delayed the completion of the Tactical Input Segment (TIS) integration. The TIS is the critical link between receipt, exploitation, and dissemination of imagery. The TIS testing schedule is being reevaluated in parallel with the TARS decision to align the interrelated efforts.

3. (U) COST CHANGES: AF reprogrammed $3.7M of FY91 TARS funding for Military Personnel. Congress declined the reprogramming, and the funds were returned in late FY91 to the program. Due to the projected TARS schedule slip, and low execution rates, $2.807M of the $3.7M was transferred to the JSIPS prime contract to lower the governments' outyear obligations.

F. (U) PROGRAM DOCUMENTATION:
- (U) SOC, Jan 87
- (U) Son, USAF 002-85, Feb 88
- (U) TEMP, Dec 89
- (U) JSORD, Dec 90

G. (U) RELATED ACTIVITIES:
- (U) MOAs with USN, USA and USMC. PE 060373A and PE 0604718M.
- (U) PE 0207435F, MVS and national /tactical JSIPS procurement.
- (U) PE 0207213F, Class V Modifications, Electro-Optical Long Range Oblique Photography System (EO LOROPS) funding.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

(U) Procurement (3080):

| PE 0207435F | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 21,962 | 18,475 | 93,249 | 133,686 |
| Qty | | | | | |
| JSIPS | 0 | 1 | 1 | 4 | 6 |
| MVS | 0 | 0 | 1 | 6 | 7 |

Note: JSIPS quantities reflect national and tactical segments

(U) Military Construction: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

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

Project: # 3364
Budget Activity: #4 - Tactical Programs

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

| Event | Date | Results |
|---|---|---|
| Altitude Chamber Tests | Jul 91 | Successful |
| Environmental/Mobility Testing | Aug 91 | Softcopy Exploitation Segment, Communications & Exploitation Support Segment, System Support Segment |
| D1 Accreditation | Oct 91 | National System w/o Hardcopy Exploitation Segment (HES) |
| D2 Qualification Testing | Dec 91 | HES |

T&E ACTIVITY (TO COMPLETION)

| Event | Date | Remarks |
|---|---|---|
| D System Qualification Test | Jan 92 | National System w/HES |
| D System Accreditation | Feb 92 | National System w/HES |
| Tactical System DT&E w/ATARS | FY 92 | Eglin AFB, Fl |
| Tactical System Multi-Service OT&E | FY 93 | ATARS-equipped F/A-18D and RF-4C |

FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

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

Project: # 3792
Budget Activity: #4 - Tactical Programs

Project Title: F-16R

POPULAR NAME: Recce Falcon

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

| Budget ($000) | FY 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| Major Contract | 0 | 31,855 | 43,472 | 7,140 |
| Support Contract | 0 | 1,784 | 1,600 | 1,210 |
| In-House Contract | 0 | 1,010 | 2,080 | 650 |
| GFE/ Other | 0 | 1,050 | 1,290 | 0 |
| Total | 0 | 35,699 | 48,442 | 9,000 |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | To Complete |
| Program Milestones | N/A | EMD Authorized | N/A | MS III |
| Engineering Milestones | N/A | N/A | Preliminary Design Review | Critical Design Review |
| T&E Milestones | N/A | N/A | N/A | DT/IOT&E |
| Contract Milestones | N/A | ACSN Released | N/A | Production Thru FY99 |

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

Project: # 3364
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, designated as the F-16R, meets the requirement in capability and cost-effectiveness. The F-16R project focuses on modifying existing F-16 aircraft to provide a low-level, day/night, all-weather reconnaissance capability through a fully integrated tactical reconnaissance pod containing the Tactical Air Reconnaissance System (TARS). The F-16R will use existing hardware to provide the pilot with a "hands-on, head-up" capability. The TARS-equipped F-16R 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 1991 Planned Program: Not Applicable.

2. (U) FY 1992 Planned Program:

- (U) F-16R Advanced Change Study Notice (ACSN) released.
- (U) Time and Materiel risk reduction effort initiated to span the gap between ACSN and Engineering and Manufacturing Development (EMD) authorization.
- (U) Initiate the Interface Control Document between the F-16R and Tactical Air Reconnaissance System (TARS) projects
- (U) Engineering and Manufacturing Development Authorization.

3. (U) FY 1993 Planned Program:

- (U) Conduct cockpit missionization simulation.
- (U) Pod development.
- (U) Operational Flight Program modification.
- (U) Terrain-Following Radar modification development.
- (U) Preliminary Design Review (PDR).
- (U) Flight test planning and preparation.

4. (U) Program to Completion:

- (U) Critical Design Review (CDR)
- (U) DT&E and IOT&E.
- (U) MS III.

D. (U) WORK PERFORMED BY: ACSN released to General Dynamics, Fort Worth, Texas. 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: # 3792
Budget Activity: #4 - Tactical Programs

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: Delays in the delivery of the Tactical Air Reconnaissance System (TARS) sensor suite combined with FY91 Congressional Language preventing the start of the F-16R effort have required readjustments to the schedule. The program office is refining the schedule based on the availability of a production representative sensor suite for the F-16R OT&E to support a production decision for modification kits and reconnaissance pods.

3. (U) COST CHANGES: The refined schedule will include associated cost changes. FY93 and out funding adjustments are a result of the delay in the start of the F-16R project from FY91 to FY92 and the slip in TARS hardware deliveries.

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, 30 May 91

G. (U) RELATED ACTIVITIES:

- (U) PE 0207133F, F-16.
- (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, BA05/06/07):

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 10,060 | 50,190 | 435,076 | 495,326 |
| Qty | | | | | |
| Sensors | 0 | 0 | 20 | 85 | 105 |
| Pods | 0 | 0 | 20 | 118 | 138 |
| Kits | 0 | 0 | 20 | 130 | 150 |

Note: Also reflected under Project #3201, TARS

(U) Military Construction: Not applicable.

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

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

Project: # 3792
Budget Activity: #4 - Tactical Programs

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 |
|---|---|---|
| Pod Certification | FY 94 | None. |
| DT&E and IOT&E | FY 96 | None. |
| IOT&E Complete | FY 97 | None. |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|---|
| 0001 | TENCAP | 346 | 558 | 700 | Cont | TBD |
| Total | | 346 | 538 | 700 | Cont | TBD |

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

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 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 tactical utility assessments of national systems.

(U) FY 1991 Accomplishments:

- (U) Successfully flew integrated suite of imagery/ELINT processor onboard C-141 aircraft, flying simulated SOF missions. National and theater situational data directly sent to aircraft in near real time (NRT). Data displayed in 3-D and integrated with GPS. Both aircrew and USA contingent had access to data.

(U) FY 1992 Planned Program:

- (U) Continue prototype of the workstation flown on the C-141 to receive, correlate and display all source intelligence data.
- (U) Begin planning for TENCAP JCS Special Project 93. The Air Force is Executive Agent for this joint exercise designed to demonstrate, educate, and influence operations relative to the tactical use of national systems.

(U) FY 1993 Planned Program:

- (U) Execute JCS Special Project 93.
- (U) Study artificial intelligence techniques to manipulate multi-spectral imagery to satisfy tactical user targetting needs and improving NRT interfaces to national systems/data bases.

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

(U) Work Performed By: Executive agent for this effort is Air Force Space Command, Peterson AFB, Colorado.

(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 national systems.
- (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 1991 Estimate | FY1992 Estimate | FY1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 109 | 129 | Cont | TBD |

(U) International Cooperative Agreements: Not Applicable

FY 1993 RDT&E DESCRIPTIVE SUMMARY

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

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Tacit Rainbow | 9429 | N/A | N/A | N/A | N/A |

B. (U) BRIEF DESCRIPTION OF ELEMENT:
The TR missile was intended to meet a requirement.for emitter attack capability. The program was terminated in February 1991.

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

1. (U) Tacit Rainbow

(U) FY 1991 Accomplishments:
- (U) Complete truncated flight test program
- (U) Conduct program closeout activities

(U) FY 1992 Planned Program: Not Applicable

(U) FY 1993 Planned Program: Not Applicable

(U) Program to Completion: Not Applicable

(U) Work Performed By: The Northrop Corporation (Newbury Park, CA) was the prime contractor for the air launch TR program. Northrop's major subcontractors included: 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.

(U) Related Activities:

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

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

(U) International Cooperative Agreements: Not Applicable

FY 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2704 EIFEL | 2,126 | 1,883 | 0 | 0 | 30,473 |

B. (U) BRIEF DESCRIPTION OF ELEMENT: Funds the US portion of a five nation cooperative program to upgrade the four automated command and control systems called Allied Tactical Operations Centers (ATOC) in NATO's central region. The US supports the ATOC located in Sembach AB, GE. Fielded in the mid-1970s, the Elektronisches Information und Fuhrungsystem fur die Einsatzbereitschaft der Luftwaffe (EIFEL) system is being replaced by the EIFEL I Lifetime Extension (EILE) administered by the German government. Under this effort, the US Air Force is working with the Federal Republic of Germany, Belgium, the Netherlands, and the United Kingdom in the joint development for major software enhancements to fully integrate the EILE system. In addition to replacing the EIFEL sytem, improvements are being developed 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 1993:

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

(U) FY 1991 Accomplishments:
- (U) Began software development, integration and testing.
- (U) Developed an interface between EIFEL and the Wing Command and Control System (WCCS).
- (U) Developed computer aided instruction training packages.

(U) FY 1992 Planned Program:
- (U) Simulation/connectivity to USAFE Warrior Preparation Center.
- (U) Install the Siemens H90 computer to host the EIFEL systems at the software maintenance center.
- (U) EIFEL interface with Advanced Planning System (APS).
- (U) Analysis of EILE and develop plan/schedule.

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

(U) Work Performed By: Because of non-performance and an unuseable software product, the Dornier contract for the EILE system was terminated. The German law allows only Germans to officially negotiate with the contractor. Since the Germans govern settlement of contractual and legal implications, it is unclear if there are any US termination or penalty costs with Dornier. The Siemens Corporation (German) has replaced Dornier as the developing contractor for EILE.

(U) Related Activities:
- (U) Program Element #0207415F, USAFE Command and Control System developed the Wing Command and Control System.

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

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

(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 EILE 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 Financial Agreements define each nation's liability as a percentage of the total contract cost within the cap set by the MOU.

FY 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| TACSI | 10,262 | 23,347* | 24,100 | Cont | TBD |

* $4M of Desert Storm Supplemental funds assigned to this program element for accounting purposes only. Funds will be distributed to various minor Desert Storm projects in accordance with Congressional FY92 appropriations.

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 Tactical Air Control System Improvements (TACSI) RDT&E program consists of Modular Control Equipment (MCE) Pre-Planned Product Improvements (P3I). The P3I program is structured into multi-block segments. Block A consisted of the HAVE QUICK radio integration and the AN/TPS-75 radar interface which have already been incorporated into the production line. Block B R&D includes integration of Joint Tactical Information Distribution System (JTIDS) class 2 terminals, an Automated Air Tasking order capability (AATO), upgrade to the satellite/troposcatter radio and digital interfaces, and secure anti-jam VHF radios. The planned Block C includes TADIL J Reissue II, work toward a Theater Missile Defense capability, and the Interim JTIDS Message Standard (IJMS). The program element also includes production for the MCE, the AN/TPS-75 radar, the Anti-Radiation Missile Decov for the TPS-75, and the Contingency TACS Automated Planning System (CTAPS).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Completed basic MCE P3I hardware fabrication for Block B.
   - (U) Completed MCE P3I Block B software through version 3 of 11.

2. (U) FY 1992 Planned Program:
   - (U) Develop software for receipt of AATO, JTIDS class 2 terminals, and digital/secure communications upgrades - through version 6 of 11.
   - (U) Incorporate secure, anti-jam VHF radios.
   - (U) Begin in-plant testing of Block B hardware and software.

3. (U) FY 1993 Planned Program:
   - (U) Complete Block B hardware testing
   - (U) Continue Block B software development and testing.

4. (U) Program to Completion:
   - (U) Complete Block B MCE P3I software through version 11.
   - (U) Start and complete Block C P3I R&D and production. Block C software/firmware upgrades add the latest TADIL J software version for interface with other US Command and Control (C2) and tactical air defense platforms, work towards an theater missile defense C2 capability, and integration of IJMS for NATO AWACS and NATO ground C2 interfaces.



UNCLASSIFIED

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

4. (U) Program to Completion (continued):
   - (U) Start and complete Block D P3I R&D and production. Block D R&D consists of simulation improvements, HAVE QUICK IIA integration, and NATO Air Command and Control Systems interface.

D. (U) WORK PERFORMED BY: The MCE P3I and TACSI production programs are managed by the Electronics Systems Division (ESD), Hanscom AFB, MA. The MCE 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. CTAPS is managed by Tactical Air Command and developed by the DOE Idaho National Engineering Laboratory.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Added Hardware Qualification Testing to Block B to support the FY 93 Block B hardware production decision. Added a Mass Memory Controller (MMC) and a VHSIC upgrade to Block B to double computer memory size, increase processing speed, improve timing and sizing, and provide required growth reserves. This allowed the AF to use one MCE Operations Module instead of the planned two at selected field units. This in turn enabled the AF to reduce the total MCE procurement quantity to remain within available procurement funding while satisfying operational requirements.
2. (U) SCHEDULE CHANGES: Software development schedule stretched one year to complete in FY 95 due to additional tasks. Software will be completed and integrated into the production kits prior to first delivery in FY 96. Block C start slipped from FY93 to FY94
3. (U) COST CHANGES: AF decreased FY 93 funding $1M for higher priorities. Added technical scope will increase program cost in outyears.

F. (U) PROGRAM DOCUMENTATION:
- (U) Rome Air Development Center (RADC) TR-75-320, "Project SEEK SCREEN," July 1976 (S).
- (U) TAF SORD for MCE, 14 Sep 89,
- (U) TAF SON 316-80, "Improved Tactical Air Surveillance/Improved Tactical Air Control System", dated 17 Nov 80 (S), amended 15 Jul 83.
- (U) Decision Coordination Paper (DCP) for Modular Control Equipment (MCE), 10 Feb 87 (S).
- (U) Joint TEMP, MCE, 1 Sep 89.
- (U) AF Mission Need Statement for Theater Missile Defense, June 1991.

G. (U) RELATED ACTIVITIES:
- (U) PE 0206626M, Tactical Air Operations Module (TAOM) is a joint USAF/USMC program. The TAOM/MCE contract is administered by the USMC under a Memorandum of Agreement between the Navy and the Air Force.
- (U) MCE P3I integrates PE 0604771D and 0604754F, the Joint Tactical Information Distribution System (JTIDS) terminals and provides secure anti-jam VHF radios via PE 0207423F, the Single Channel Ground and Airborne Radio System (SINCGARS).
- (U) $95M of Air National Guard (ANG) FY92 funds will purchase 14 additional MCE production Operations Modules essential for ANG unique requirements.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

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

(U) Other Procurement (BA 4):

| | FY 1991 Actual | FY 1992 Estimate | FY1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 147,957 | 66,321 | 96,069 | Cont | TBD |
| Quantities: | | | | | |
| MCE | 21* | 14* | 0 | 0 | 80 |
| ARM Decoy | 0 | 14 | 0 | Cont | 16 |
| AN/TPS-75 | 15* | 3 | 0 | Cont | 57 |
| P3I Kits | 0 | 0 | 38 | Cont | 94 |
| CTAPS | 3 | 5 | 5 | Cont | 24 |
| JTIDS Terminals | 0 | 0 | 0 | Cont | 52 |

* Includes ANG quantities; the funding line includes active AF only.

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 Jul 1993
3. (U) P3I Production deliveries. 1996

FY 1993 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 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| Major Contracts | RSIP 64,079<br>30/35 25,050 | 116,296<br>52,411 | 60,646<br>34,421 | TBD<br>TBD |
| Support Contract | 13,794 | 10,855 | 11,500 | TBD |
| In-House Support | 14,865 | 16,380 | 15,130 | TBD |
| GFE/ Other | 7,656 | 9,231 | 9,203 | TBD |
| Total | 125,444 | 205,173 | 130,900 | TBD |

| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| Program Milestones | | Block 30/35 Milestone 3 | | RSIP Milestone 3 |
| Engineering Milestones | RSIP CDRs 1-9/91 | | | |
| T&E Milestones | 30/35 DT/OT 9/90-3/92 | RSIP Performance Demo | RSIP DT&E 1Q/93-1Q94 | RSIP IOT&E 1Q/94-2Q/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 theater forces and for air defense of the United States. These improvements include Electronic Support Measures (ESM), CC-2E Computer Memory Upgrade, and Joint Tactical Information Distribution System (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 small airborne targets, and improve ECCM, reliability, and maintainability.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Block 30/35 EMD continued and DT&E flight testing began on the modification kits. Over forty test flights were flown and the preliminary results look favorable. ESM integration and checkout began and US and NATO ESM flight test planning for IOT&E was accomplished.
   - (U) RSIP EMD continued. Software PDR and hardware and software CDRs were successfully accomplished. Hardware fabrication and software coding began.
   - (U) The second segment of RSIP brassboard flight testing in elevation scan mode was successfully conducted.

2. (U) FY 1992 Planned Program:
   - (U) Complete Block 30/35 DT&E/IOT&E and finish basic EMD activities. A Milestone IIIA low rate initial production decision is scheduled for late FY92 after 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 kit 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 EMD 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.

3. (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 Block 30/35 baseline, and testing of the ESM emitter library file expansion. Block 30/35 production contracts will be awarded and the Milestone IIIB full rate production decision will be made.

Program Element: 0207417F
PE Title: Airborne Warning and Control System
Project Number: N/A
Budget Activity: 4-Tactical Programs

- (U) Radar System Improvement Program (RSIP) EMD will continue with 90 DT&E flight tests, reliability verification testing, maintainability demonstration, and software qualification scheduled.

4. (U) Program to completion: Block 30/35 RDT&E activities finish with completion of logistics support efforts. RSIP RDT&E activities finish with completion of all qualification testing and DT&E/IOT&E efforts.

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 (Joint Tactical Information Distribution System [JTIDS])

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: None.
2. SCHEDULE CHANGES: Block 30/35 IOT&E completion slipped from Aug 91 to Mar 92 due to correction of ESM problems identified in initial flight tests. RSIP CDR slips from Jun to Sep 91 due to increased time needed for Ada software design. RSIP IOT&E completion slips from first to second quarter FY94 due to the software schedule.
3. COST CHANGES: FY91 RDT&E funding increased $3.3M in a reprogramming action to support a FY91 RSIP contract requirement with the Westinghouse Corporation. FY92 RDT&E funding increased a net $3.5M as a result of the second Desert Storm Supplemental appropriation (+$7.3M) and AWACS share of general Congressional reductions (-$3.8M). FY93 RDT&E funding decreased $5.9M for various non-programmatic reductions including deflation and reversal of funding policy for financial administrative actions.

F. (U) PROGRAM DOCUMENTATION:

- (U) ROC No: ADC/TAC-1-66 (S), 1 Sep 66
- (U) DCP No. 5, Rev 4, E-3A (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
- (U) SORD for E-3 ESM, TAF (TAC 1-66)-III-A, Aug 91
- (U) SORD for JTIDS, TAF 306-74-I/II/III, 17 Dec 90
- (U) SORD for NAVSTAR GPS, AFSPACECOM (USAF 003-78), 22 Jan 90

G. (U) RELATED ACTIVITIES:

(U) Development of the JTIDS Class 2H terminal required for the Tactical Digital Information Link is funded in PE 0604771D, Common JTIDS.

(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.

Program Element: 0207417F | Project Number: N/A
PE Title: Airborne Warning and Control System | Budget Activity: 4-Tactical Programs

(U) United Kingdom and France direct commercial E-3 purchases include, and are dependent upon, the USAF-developed E-3 integration of the Joint Tactical Information Distribution System (JTIDS) Class 2H/Tactical Digital Information Link (TADIL) J terminal and central computer memory upgrade.

(U) Discussions continue on US participation in the NATO AWACS 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 (BP1100)

| | FY 1991 Actual | FY 1992 Estimate | FY1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 18,700 | 50,897 | 75,221 | 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 system for US and NATO E-3 aircraft. Total FSD cost is estimated at $150 million with NATO contributing a 35% share. Preliminary discussions on cooperative ESM production began in FY92. An Addendum Multilateral MOU (MMOU) for NATO AWACS 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 (CC-2E Memory Upgrade, Color Consoles, HAVE QUICK Communications, JTIDS TADIL J, COMSEC, Self Protection, & Mobility Support Equipment). The NATO CC-2E Memory Upgrade production contract was awarded in Jun 91. Formal negotiations with NATO on a cooperative RSIP EMD MOA began in FY92. The UK and France have initiated program definition activities for an eventual RSIP procurement and retrofit program via foreign military sales. The French have also expressed an interest in acquiring ESM.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (Past 36 MONTHS)

| Event | Date | Results |
|---|---|---|
| RSIP BrassBd Flt Testing 1 | Feb-Mar 1990 | Successful |
| RSIP BrassBd Flt Testing 2 | 2Q/FY91 | Successful |

T&E ACTIVITY (TO COMPLETION)

| Event | Date | Remarks |
|---|---|---|
| ESM DT&E/IOT&E | Sep 1990-Mar 1992 | On track |
| Block 30/35 DT&E/IOT&E | Sep 1990-Mar 1992 | On track |
| RSIP DT&E | 1Q FY93-1Q FY94 | |
| RSIP IOT&E | 1Q FY94-2Q FY94 | |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| ABCCC Improvements: | 0 | 3,451 | 6,300 | 0 | 9,751 |
| Total | 0 | 3,451 | 6,300 | 0 | 9,751 |

B. (U) BRIEF DESCRIPTION OF ELEMENT: 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 C3I units. The primary mission of the ABCCC is to provide on scene tactical battle management for Tactical Air Forces. It receives target nominations from the TACC or other C3I systems (i.e., Joint Surveillance Target Attack Radar System (JSTARS), Air Support Operations Center(ASOC), etc) and assigns direct air, sea, and land operations to developing targets in the theater of operations. It can also function as a direct extension of the Tactical Air Control Center (TACC), an airborne ASOC, or the Air Component Commander's operations center. ABCCC's extensive capabilities allow it to support functions across a broad-spectrum of operations; from Forward Battle Coordination and coordination of Joint Forces, to Close Air Support (CAS), Air Drops, Search and Rescue (SAR), and Crisis Management. The ABCCC has been battle proven time and again, in Vietnam, Grenada, Panama, and Operation Desert Storm. Pre-planned product improvements (P3I) include upgrade of Satellite communications (SATCOM) capabilities, and installation and integration of the Joint Tactical Information Distribution System (JTIDS), CONSTANT SOURCE, and Battlefield Communication Terminals (BCT).

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

1. (U) ABCCC Improvements: This program 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, JSTARS, Modular Control Equipment (MCE), etc. These P3I efforts will enhance the system's communications, control, and information collection and dissemination capabilities through increased automation, advanced antijam communications capabilities and data links so that ABCCC can more efficiently handle the growing volume of information exchanged in the projected threat environment. The SATCOM upgrade will enable ABCCC to meet operational requirements for 3 JCS standard SATCOM systems per capsule and JCS directed 5 KHz channelization capability to maintain SATCOM interoperability with modified satellite nets. In addition to meeting JCS requirements, the ABCCC SATCOM upgrade will: provide voice/data communications on all narrow and wideband UHF SATCOM channels; provide the additional capability of line-of-sight UHF communications; enable communications relay to, or over-the-horizon interface with National Command Authorities and other C3I elements. SATCOM will be fully integrated with the capability for remote control of the

Program Element: #0207419F Budget Activity: #4 - Tactical Programs
PE Title: Tactical Airborne Command and Control System

system from any battle staff console and crewmember communications system. JTIDS integration will provide near-real-time battle situation displays to the battlestaff for making C2 decisions (i.e., directing/ redirecting airborne assets and kill box deconfliction) plus provide situational awareness, threat warning, antijam communications, and near real-time data display of the air situation to the ABCCC battlestaff. CONSTANT SOURCE and Battlefield Communication Terminals (BCT) will provide near real-time intelligence updates via data link directly to battle staff consoles and data link interface between ABCCC and Army ground units for support of Close Air Support (CAS) missions and immediate air requests.

(U) FY 1991 Accomplishments:
- (U) JTIDS integration contract awarded per JTIDS (PE 0604754F) direction and funding.

(U) FY 1992 Planned Program:
- (U) Award contract for SATCOM hardware, firmware, and software upgrades to the ABCCC communications subsystems.
- (U) Complete preliminary SATCOM hardware, software, and firmware design through Preliminary Design Review.
- (U) Continue JTIDS integration through Critical Design Review

(U) FY 1993 Planned Program
- (U) Complete SATCOM design effort.
- (U) Conduct SATCOM system verification, validation and test.
- (U) Continue JTIDS integration through prototype install, Joint Operational DT&E/IOT&E, Functional Configuration Audit/Physical Configuration Audit (FCA/PCA), initial flight test and evaluation.

(U) Work Performed By: ESD Hanscom AFB, MA manages the program. The JTIDS integration contractor is Paramax Systems Corporation (a UNISYS owned company), of St Paul, Minnesota. The SATCOM integration contract has not been awarded.

(U) Related Activities:
(U) Program Element #0303605F, develops SATCOM Terminals.
(U) Program Element #0604774D, Joint Tactical Distribution System (JTIDS) develops the Class II terminals.
(U) Program Element #0604754F, JTIDS funds AF JTIDS integration.
(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 05, Modifications)

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 0 | 2,005 | 4,586 | 6,591 |

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0207423F Budget Activity: #4 Tactical Program
PE Title : Advanced Communication Systems

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2982 Anti-Jam Comm | 4,339 | 3,391 | 500 | 13,300 | 96,896 |
| Total | 4,339 | 3,391 | 500 | 13,300 | 96,896 |

B. (U) BRIEF DESCRIPTION OF ELEMENT:
The Air Force, Navy, Marine Corps and NATO rely chiefly on Ultra High Frequency (UHF) voice communications for combat operations. UHF anti-jam (AJ) protection is crucial to successful combat operations. This program funds development and procurement of the next generation interoperable AJ UHF radio which will replace the fleetwide AN/ARC-164 (HAVE QUICK) aircraft UHF radio. The new radio, the AN/URC-126, successfully completed Development Test & Evaluation (DT&E) in Apr 90 and will enter production in FY 1993. The Second-generation Anti-jam Tactical UHF Radio for NATO (SATURN) waveform has been accepted by NATO as the standard for UHF voice communications, and will be incorporated in the AN/URC-126. AF procurement of Single Channel Ground and Airborne Radio System (SINCGARS) radios is also funded in this program. The Army developed SINCGARS is the next generation AJ VHF radio. AF procurement will ensure interoperability between air and ground AF close air support forces and supported Army units. Outyear funding includes upgrades to AJ communications capabilities such as low probability of intercept and adaptive array processing.

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

1. (U) 2982, Anti-Jam Comm: The SATURN program replaces the AN/ARC-164 radio with the improved AJ, secure voice AN/URC-126 radio. SATURN waveform changes, producibility improvements, and Initial Operational Test & Evaluation (IOT&E) will be accomplished in FY 1991-1993.

(U) FY 1991 Accomplishments:
- (U) Issued RFP for SATURN waveform changes, producibility improvements, and first article test items for IOT&E of the AN/URC-126 radio.
- (U) Continued software support for the HAVE QUICK II radios.

(U) FY 1992 Planned Program:
- (U) Incorporate SATURN software changes, accomplish AN/URC-126 producibility changes, and add an improved secure communications capability.
- (U) Continue software support for the HAVE QUICK II radios.

(U) FY 1993 Planned Program:
- (U) IOT&E with first article test radios for the AN/URC-126.

Program Element: #0207423F Budget Activity: #4 Tactical Programs
PE TITLE: Advanced Communication Systems

- (U) Continue software support for the HAVE QUICK II radio.
- (U) Full rate production of AN/URC-126 to begin 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), 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):

| URC-126 Airborne SATURN | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| | 3,000 | 0 | 32,072 | 151,371 | 193,190 |

| ARC-XXX Airborne SINCGARS | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| | 0 | 9,300 | 0 | 15,700 | 25,000 |

(U) Other Procurement (3080, P0177 Antijam Voice)

| GRC-171B(V)4 HQ II Ground Radios | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| | 0 | 17,071 | 0 | 0 | 23,011 |

| PRC-XXX/VRC-XXX Ground SATURN Radios | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| | 0 | 9,700 | 0 | 0 | 9,700 |

| SINCGARS VHF Ground Radio | FY 1991 Estimate | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| | 4,802 | 2,450 | 1,770 | 15,157 | 24,179 |

(U) International Cooperative Agreements: Not Applicable

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 4037 | SEEK EAGLE Certifications | | | | |
| | 13,418 | 20,906 | 24,600 | Cont | TBD |
| 4038 | SEEK EAGLE Technology Applications | | | | |
| | 1,000 | 0 | 6,400 | Cont | TBD |
| Total | 14,418 | 20,906 | 31,000 | 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 configuration which are determined by operational scenarios, missions, and tactics. The loading configurations change as operational plans, and tactics change, and new aircraft and stores are developed. Before operational use, the Air Force must certify these configurations for safe loading, safe carriage, and safe separation (jettison and normal release), and must verify ballistics accuracy under the user-specified carriage and employment parameters. These certifications are carried out and funded under project 4037, SEEK EAGLE Certifications. The Air Force SEEK EAGLE process completes these certifications through any combination of ground and flight testing, wind tunnel testing, and engineering analysis. There are currently over 800 aircraft-store configurations to be certified, with new ones added on a regular basis. Depending on complexity, certifications can take from months to years. The complexity of aircraft and stores, and the technologies needed for the SEEK EAGLE process, have advanced over the last 10-15 years. But SEEK EAGLE has not had the resources to exploit and apply these various technologies. This, and the backlogged workload, is resulting in 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, the application of various new technologies to the SEEK EAGLE process will cut the turnaround times from years to months and maximize the combat capabilities of the operational forces. Project 4038, SEEK EAGLE Technology Applications, will implement new technologies into the SEEK EAGLE certification process, resulting in significant cost and time savings. Complimented with the OSD PE #0604940D for multiservice application, a modest investment in FY 1990 & 1991 allowed critical studies to be done and a comprehensive plan developed for full implementation of the technologies. There is no duplication of efforts involving OSD and Air Force technology modernization projects.

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

1. (U) Project 4038, SEEK EAGLE Technology Applications: Four (4) projects will be developed for specific Air Force application under project 4038. These projects are: Aerodynamic Analysis/Computational Fluid Dynamics, Parametrics, Computerized Physical Fit, and Airborne Weapon Test Instrumentation. These projects will have IOCs beginning as early as 1993 and continue through the FYDP. Once these projects are developed for Air Force use, they will be "transported" to the other services as required using OSD funds. This will make the Air Force developed programs compatible with the other services' computers, software, and methods of completing aircraft-stores certification. There is no duplication of any efforts between the Air Force Technology Application Projects and the OSD Central Test and Evaluation Investments Program (CTEIP - PE# 0604940D). OSD will also fund the technology transfer of the Navy

Program Element: #0207590F
PE Title: SEEK EAGLE

Budget Activity: #4 - Tactical Programs

managed High Speed Video Project and Army managed Rotary Wing Store Integration to the Air Force for application to the SEEK EAGLE certification process. Implementing each of these projects into the SEEK EAGLE process will save both time and money in the aircraft-store certification process, reducing typical certification times from years to months, and even weeks, with significant related cost savings.

(U) FY 1991 Accomplishments:
- (U) Continued work on the integrated store separation and ballistics accuracy analysis and modeling task. Developed techniques to use ground test data in the ballistics portion of the operational flight program development process.
- (U) Began development of a parametric approach to certifying stores on aircraft.
- (U) Weapon Trajectory Model Accuracy in terms of Circular Error Probable (CEP) was assessed as a function of instrumentation accuracy requirements.

(U) FY 1992 Planned Program:
- (U) Not funded.

(U) FY 1993 Planned Program:
- (U) Increase in funding above FY 91 level needed to begin implementation of the related technologies into the SEEK EAGLE process. Specific highlighted examples are below.
- (U) Continue design and produce drawings for "peel and stick" subminiature telemetry.
- (U) Begin the verification of the CFD/carriage loads.
- (U) Model first aircraft and store for physical fit analysis.

(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.

(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.

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

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 4037 SEEK EAGLE Certifications | 13,418 | 20,906 | 24,600 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Air Force SEEK EAGLE process certifies the safe loading, safe carriage, and safe release of operational weapon and store configurations 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) when applicable. Certification--safe loading, safe carriage and safe release--is determined by any combination of 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 source data for publications such as loading manuals, flight manuals, and delivery manuals--absolute essentials for operational use of aircraft and stores. SEEK EAGLE is a continuing process. 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 1992, there were 13 aircraft and 93 store types in work under SEEK EAGLE certifications and/or accuracy verification. This, in turn, involved over 800 aircraft-store configurations in various stages of the process.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Conducted UK 1000 pound bomb certification on the B-52.
   - (U) Conducted certification of TMU-28/B spray tank on the F-16 and F-15E.
   - (U) Began AIM-120 certification with LAU-106A and LAU-128 launchers.
   - (U) Began certification of AGM-65G on the F-15E.
   - (U) Continued MK 82/84, GBU-10/15, and CBU-87/89 efforts on the F-15E.
   - (U) Continued F-16C/D Block 40 certification on 12 stores.
   - (U) Conducted 31 quick reaction, weapon certification/flight clearance requests in support of Operation Desert Shield/Storm. Provided increased combat capability with new F-4, F-15E, F-16, F-111, and A-10 aircraft/weapon configurations or AC-130 ECM options. Also, expedited testing for verifying F-15E computer ballistic weapon accuracies under certain weapon delivery conditions.

2. (U) FY 1992 Planned Program:
   - (U) Complete GBU-24A/B certification on F-16.
   - (U) Conduct BLU-107 certification on F-111 at expanded flight limits.
   - (U) Begin AGM-130C certification on the F-15E and F-111F.
   - (U) Complete AIM-120/LAU-128 certification on the F-15E.
   - (U) Accomplish work on hundreds of other aircraft/store configurations in addition to these highlighted examples.
   - (U) Maintain SEEK EAGLE engineering analysis capability.

Program Element: #0207590F
PE Title: SEEK EAGLE

Budget Activity: #4 - Tactical Programs

3. (U) FY 1993 Planned Program:
   - (U) Increase in funding above FY 92 level needed to sustain certification work against an anticipated increase in the number/cost of aircraft/store configurations. Specific highlighted examples are below.
   - (U) Complete F-16 Air Defense Fighter AIM-7/9/120 certifications.
   - (U) Complete F-16C/D Block 40 and AIM-120 efforts.
   - (U) Complete High Speed Airdrop Container (HISAC) certification on the F-111.
   - (U) Complete AGM-65G and AIM-120/LAU-106 certification on the F-15E.
   - (U) Accomplish work on hundreds of other aircraft/store configurations in addition to these highlighted examples.
   - (U) Maintain SEEK EAGLE engineering analysis capability.

4. (U) Program to Completion: Certification is a continuing process.

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 process 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 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None

2. (U) SCHEDULE CHANGES: Many configuration certifications were completed and others were added during the past year to meet user requirements. Current narrative descriptions are valid.

3. (U) COST CHANGES: Certifications and related funding increased to accommodate increased user requirements in FY 93. Technology Applications funding decreased as a result of Congressional action which zeroed FY 92 funding. This forced the rebudgeting of the Technology Projects beginning in FY 93. Total program funding decreased as a result of the adjustments to the certification and technology projects.

F. (U) PROGRAM DOCUMENTATION: Numerous certification requests from users such as SAC, TAC, MAC, AFSOC, and the AF Directorate of International Programs (HQ USAF/IAR) for FMS aircraft. The SEEK EAGLE program does not have its own MNS or ORD; however, individual system ORDs 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.

Program Element: #0207590F
PE Title: SEEK EAGLE

Budget Activity: #4 - Tactical Programs

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

1. (U) PROCUREMENT:

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Other Procurement/(BA 4, I-2000) | | | | | |
| Cost | 0 | 38 | 0 | Cont | TBD |
| Other Procurement/(BA 4, MK 84) | | | | | |
| Cost | 0 | 0 | 1,407 | Cont | TBD |
| Other Procurement/(BA 4, SFW) | | | | | |
| Cost | 0 | 12,947 | 0 | Cont | TBD |

2. (U) MILITARY CONSTRUCTION: Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE: Each of the SEEK EAGLE Requests from the Air Force operational commands or HQ USAF/IAR 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 800 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 October 1993, with OFP fielding and TO publication in December 1993.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208006F
PE Title: Mission Planning System

Budget Activity: #4 - Tactical Programs

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

| Project Number & Title | FY 1991* Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3857 Conventional Mission Planning and Preparation System (CMPPS) | 50 | 5,400 | 2,000 | Cont | TBD |
| 3858 Air Force Mission Support System (AFMSS) | 7,910 | 7,298 | 13,400 | Cont | TBD |
| Total | 7,960 | 12,698 | 15,400 | Cont | TBD |

* FY 91 3857 funding excludes 6.0M in a classified program element

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Mission Planning System program supports airlift, bomber, fighter, special operation (air) forces, and tanker mission planning requirement. In the near-term, it supports SAC's Conventional Mission Planning and Preparation System (CMPPS). In the long-term, it supports all MAJCOMs and USSOCOM requirements via block upgrades. The Mission Planning System program was created to consolidate ongoing, fragmented mission planning system development efforts by individual weapon system programs. The system utilizes intelligence, weather, weapons, and electronic combat information along with aircrew inputs to plan a complete combat mission. Sortie rates, sophisticated avionics, first look and/or beyond visual range target destruction, and the ability to defeat complex threat systems requires a computer assisted mission planning system and automated data input for current and future aircraft/weapons systems. Present mission planning system capabilities are deficient in speed, storage capacity, software application, processing capability, flexibility, graphics, and automated combat mission folder preparation. AFMSS will correct these deficiences. Current mission planning systems lack a near-real-time data input to provide current enemy threat information and the capability to adequately process that data. Automated interface with Theater, Command, and Joint data bases is being planned as well as the capability to load and read automated aircraft/weapon data systems cartridge units.

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

(U) Project 3857, Conventional Mission Planning and Preparation System: The purpose is to enhance CMPPS to support interim mission planning requirements for the B-52 and the Tri-Service Standoff Attack Missile (TSSAM) program. The B-52 is the first test and operational launch aircraft for TSSAM. Aircrews cannot plan, program, and launch this autonomous guided weapon without CMPPS. This mission planning requirement will be supported by AFMSS in the future.

(U) FY 1991 Accomplishments:
- (U) Continued CMPPS Tape 2 development supporting TSSAM
- (U) CMPPS Tape 1 delivered
- (U) Demonstrated operational capability of CMPPS Tape 1 (gravity weapons)

Program Element: #0208006F
PE Title: Mission Planning Systems

Budget Activity: #4 - Tactical Programs

(U) FY 1992 Planned Program:
- (U) CMPPS Tape 2 integration and test
  - (U) 70% of FY 92 funds for integration effort
    - (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

(U) FY 1993 Planned Program:
- (U) Continue CMPPS Tape 2 integration and test
- (U) Deliver CMPPS Tape 2

(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. CMPPS contractors are Boeing Military Airplane of Wichita, Kansas and McDonnell Douglas of Omaha, Nebraska.

(U) Related Activities:
- (U) Program Element 0101313F, 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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208006F
PE Title: Mission Planning System

Budget Activity: #4 - Tactical Programs

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

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Air Force Mission Support System (AFMSS) | 7,910 | 7,298 | 13,400 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
AFMSS supports airlift, bomber, fighter, special operation (air) forces, and tanker mission planning requirements via block upgrades. Sortie rates, sophisticated avionics, first look and/or beyond visual range target destruction, and the ability to defeat complex threat systems require a computer assisted mission planning system and data input for current and future aircraft/weapons systems. AFMSS will interface with Theater, Command, and Joint data bases to provide intelligence, weather, weapons, and electronic combat information for mission planning. Aircrews will use the mission planner 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 system will load and read aircraft/weapon Data Transfer Cartridge (DTC) units. The success of a combat sortie is jeopardized without AFMSS to support mission planning requirements

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) MSS II software improvements
   - (U) AFMSS Block A contract award
     - (U) Block A upgrade designed to meet LANTIRN and other near term TAF requirements
   - (U) AFMSS Block B "Flyoff" contact award
     - (U) Block B fulfills Core mission planning requirements for all commands

2. (U) FY 1992 Planned Program:
   - (U) AFMSS Block A modification starts
   - (U) Integration of F-15/F-16 and MH-53J mission planning modules with the AFMSS Block B prototypes
   - (U) DT&E/Demonstration of AFMSS Block B capabilities

3. (U) FY 1993 Planned Program:
   - (U) AFMSS Block B downselect
   - (U) AFMSS Block B deliveries start
   - (U) AFMSS Block C enhancement
     - (U) Upgrade AFMSS Block B software
     - (U) Develop one-man portable [illegible] planning hardware
     - (U) Integration of additional weapon systems: B-52, B-1B, C-130, MC-130, F- 16 Block 50 etc.
       - (U) The increase in FY 93 funding is needed to integrate additional aircraft and associated weapons systems on AFMSS
     - (U) AFMSS Block C contract award

Program Element: #0208006F
PE Title: Mission Planning Systems

Budget Activity: #4 - Tactical Programs

4. (U) Program to Completion:
   - (U) Complete AFMSS Block enhancement to satisfy airlift, bomber, fighter, SOF, and tanker 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. Contractor for AFMSS Block A Upgrade is Lockheed Sanders of Nashua NH. A flyoff for AFMSS Block B is being conducted between Lockheed Sanders and McDonnell Douglas Missile Systems of St. Louis MO.

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

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Fairchild protested AFMSS Block A/B contract award. Protest delayed program six months. 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

G. (U) Related Activities:
- (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 | 26,378 | Cont | TBD |
| Qty | 0 | 0 | 15 | 95 | Cont | TBD |

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

Program Element: #0208006F
PE Title: Mission Planning Systems

Budget Activity: #4 - Tactical Programs

J. (U) MILESTONE SCHEDULE:

| | |
|---|---|
| 1. (U) AFMSS RFP | Sep 90 |
| 2. (U) AFMSS Block A/B Contract Award | Apr 91 |
| 3. (U) AFMSS Block A/B Contract Resolution | Aug 91 |
| 4. (U) AFMSS Block A Deliveries Begin | Jan 92 |
| 5. (U) AFMSS Block B Downselect | Jan 93 |
| 6. (U) AFMSS Block C Contract Award | Jan 93 |
| 7. (U) AFMSS Block B Deliveries Begin | Apr 93 |
| 8. (U) AFMSS Block C Delivers Begin | Jan 94 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Support and Integration (TRI-TAC) | 4,602 | 6,042 | 12,700 | -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 over the past several years 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 1991 Accomplishments:
   - (U) Continued prior integration and software activities for TRI-TAC.
   - (U) Initiated detailed development planning to resolve TRI-TAC data incompatibility problems.
   - (U) Continued developments to provide compatibility with Army mobile subscriber equipment program.
   - (U) Released government developed prototype System Process System Control (SPSC) software for field demonstration.

2. (U) FY 1992 Planned Program:
   - (U) Prior integration activities will continue for TRI-TAC.
   - (U) Support Modular Control Equipment (MCE) integration in USAFE and NATO interface.
   - (U) Develop multi-channel operational line evaluator (MOLE) for TSC-100A, TSC-94A, and TRC-170.
   - (U) Start System Planning and System Control (SPSC) engineering & manufacturing development (EMD) based on the government prototype.

3. (U) FY 1993 Planned Program:
   - (U) Complete TRI-TAC equipment integration.
   - (U) Complete MCE integration in USAFE.
   - (U) Complete MOLE prototype development and integrate hardware with SPSC software development.
   - (U) Complete SPCS software development and testing.

Program Element: #0208010F Project Number: 2270
Title: Joint Tactical Communications Budget Activity: #4 - Tactical Programs

with SPSC software development.
- (U) Complete SPCS software development and testing.

4. (U) Program to Completion:
- (U) AF is examining outyear requirements and will address new interface problems in FY 94 and beyond.

D. (U) WORK PERFORMED BY: The Electronic Systems Division, Hanscom AFB, MA manages the Air Force portion of the program. Contractors include: Raytheon Corp, Sudbury, MA, and 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 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

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

F. (U) PROGRAM DOCUMENTATION:
- (U) PMD 5090(28)/28010F, Joint Tactical Communications Program, 19 Mar 91.
- (U) PMD 2244(1)/28010F, Secure, Survivable Communications, 19 Aug 91.
- (U) Joint Operational Requirement, SM-394-74, Tactical Communication Control Facilities, 21 Jun 74.
- (U) Joint Operational Requirement, SM-86-75, Family of Tactical Digital Troposcatter Radios, 19 Feb 75.

G. (U) RELATED ACTIVITIES:
- (U) PE 0207412F, Tactical Air Control System Improvements, is developing the MCE which will be integrated into USAFE using technical support from this 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 (3080)(BA-3,P-1 Line 835100)

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 15,965 | 48,418 | 70,807 | Cont | TBD |

(U) MILITARY CONSTRUCTION: Not Applicable.

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

J. (U) MILESTONE SCHEDULE:

Program Element: #0208010F Project Number: 2270
Title: Joint Tactical Communications Budget Activity: #4 - Tactical Programs

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. | Start SPSC EMD | 2nd Qtr 92 |
| 2. | Complete SPSC EMD | 3rd Qtr 93 |
| 3. | Field SPSC | 4th Qtr 93 |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 374 - C3 PROTECTION/MULTI-MISSION, TECHNOLOGY AND SUPPORT | | | | | |
| TOTAL | 2051 | 2651 | 2200 | 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 the services and U&S Commands, JCS made the Systems Engineering (SE) function a permanent part of the Joint Electronic Warfare Center (JEWC) mission. The Air Force, as executive agent, is responsible for the total funding of this essential effort.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 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 1991 Accomplishments:

- (U) [ ] for NAVY/FLTDECGRUPAC. System delivered, field testing to begin 3Q92.
- (U) [ ] Prototype delivered, demonstrations ongoing.
- (U) [ ] Program complete.
- (U) Developed Mobile Communications Countermeasures System (MCCS), a highly mobile VHF/UHF jammer that allows jamming on the move. Prototype delivered and tested 4Q91.
- (U) Developed VHF/UHF Hand Held Expendable Jammer (HEXJAM). Northrop and Loral each delivered 11 prototypes. Joint evaluations and demonstrations have been completed.

Program Element: #0208021F
PE Title: Electronic Combat Support

Budget Activity: #4 - Tactical Programs

- (U) Developed two Army HF Antennas (JAMAIR): [redacted] Program completed.
- (U) Developed Army Communications ECM/ECCM Training System (ACETS) to provide an ECM/ECCM training system that does not radiate actual jamming signals. Testing scheduled for 2Q92.
- (U) Developed follow-on to MCCS to provide EW support for Low Intensity Conflict (LIC). Testing and demonstration scheduled for 4Q92.
- (U) [redacted] Prototype delivery scheduled for 3Q92.
- (U) [redacted] Contract award imminent.
- (U) Develop airborne communications/radar jamming training system based on ACETS (FY90) for the Air Force. Contract award for project definition imminent.
- (U) [redacted] for NAVY/FMFLANT. Contract discussions ongoing.
- (U) [redacted] for SOCEUR. Hardware to be delivered 2Q92.
- (U) [redacted] Feasibility study underway.

(U) FY 1992 Planned Program:

- (U) [redacted] Prototype delivery expected 4Q92.
- (U) [redacted] Project refinement/contractor discussions ongoing.
- (U) [redacted] Project refinement/contractor discussions ongoing.
- (U) [redacted] Project refinement/contractor discussions ongoing.
- (U) [redacted] Project refinement/contractor discussions ongoing.
- (U) Develop UAV radar jammer to detect, target, receive, and/or deny acquisition or tracking by hostile radars. Project refinement/contractor discussions ongoing.
- (U) Continue other unfinished projects as required.

(U) FY 1993 Planned Program:

- (U) Investigate technologies and develop prototypes to improve ESM.

Program Element: #0208021F
PE Title: Electronic Combat Support

Budget Activity: #4 - Tactical Programs

- (U) Develop methods to facilitate processing and identification of new complex threat emissions.
- (U) Develop advanced ECM for use against more sophisticated future threat systems.

- (U) Continue to develop a frequency hopping capability for MCCS.
- (U) Continue ACETS development and testing.

- (U) Continue to investigate EW technologies to support contingencies, Low Intensity Conflict (LIC), and special operations.
- (U) Continue other unfinished projects as required.

(U) Work Performed By: The JEWC, at Kelly AFB, Texas, performs independent studies and analysis leading to the development of engineering prototypes for field demonstration/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. Some of these laboratories include the Air Force Geophysics Laboratory, Eglin AFB, Florida; the Pacific Missile Test Center, Point Magu, California; and the Naval Ocean System Center, San Diego, California. Where required technologies are not available within DOD, the JEWC manages contractual efforts to produce, test, and demonstrate prototypes. JEWC currently has an engineering support contract with Northrop Defense Systems Division (NDSD), Rolling Meadows, Il. Under JEWC management, NDSD performs engineering analysis, procures, fabricates, tests and demonstrates engineering models to satisfy CINC identified operational shortfalls.

(U) Related Activities:
- (U) JEWC/SE programs support services and joint electronic combat (EC) programs.
- (U) JEWC/SE builds upon technologies demonstrated in PE 0604270F, EW Development, and other service's related PE's.
- (U) Technology development is related to that being developed in the following PE's:

(U) Other Appropriations Funds ($ in Thousands): not applicable.

(U) International Cooperative Agreements: not applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0301357F
PE Title: NUDET Detection System (NDS)
Project Number: #0001
Budget Activity: #3-Strategic Programs

A. (U) RESOURCES ($ in Thousands)

| Project Title / Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Nuclear Detonation Detection System (NDS) | [ | | ] | 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. 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 (GNTs). 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) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Continued engineering development of sensor integration design for GPS Block IIR satellites.
   - (U) Qualified the Block IIR NDS satellite crosslink and downlink design
   - (U) Developed engineering solutions to deficiencies identified during testing.

2. (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) Transferred $1.5M to a Defense Intelligence Agency Program Element (PE). Funds still available to the NDS program, but under this DIA PE.

3. (U) FY 1993 Planned Program:
   - (U) Complete design corrections to any deficiencies identified during test.
   - (U) Begin installing NDS on Block IIR satellites.

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

Program Element: #0301357F
PE Title: NUDET Detection System (NDS)

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

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 assistance of [ ] 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. E-Systems, Garland, TX, is producing the EMP receiver/processor for the Block II satellites.

E. (U) COMPARISON WITH FY 1992 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) System Operational Requirements Document 004-77-I/II/III, 17 March 91
- (U) Program Management Directive 6112(14), 1 March 91

G. (U) RELATED ACTIVITIES:
- (U) PE 0305165F, Navstar Global Positioning System (GPS) Space Segment.
- (U) PE 0305913F (formerly 0102433F), Nuclear Detonation Detection System (NDS)
- (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 1991 Actual | FY1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | [ | | | | ] |
| Quantities | 0 | 4 | 6 | | |

I. (U) International Cooperative Agreements: None.

J. (U) MILESTONE SCHEDULE:
1. (U) Deliver First Block IIR Satellite Late 1995

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303110F Project Number: 0001
PE Title: Defense Satellite Communications System (DSCS) Budget Activity: #5 - Intelligence & Communications

A. (U) RESOURCES ($ in Thousands)

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| DSCS | 19,089 | 15,160 | 15,300 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: 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 ground mobile forces of all services. Relays critical satellite Telemetry, Tracking and Command (TT&C) data from remote tracking stations within the Air Force Satellite Control Network (AFSCN). Procures Integrated Apogee Boost Subsystem (IABS) which is required in order to launch DSCS satellites on Atlas-II booster.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Completed IABS development for DSCS launches on Atlas-II booster.
   - (U) Delivered DSCS IIIB-14 satellite (last multiyear satellite) with IABS modifications for first Atlas-II launch in FY 1992.
   - (U) Delivered IABS-equipped DSCS IIIB-12 to Cape Canaveral for second Atlas-II launch in FY 1992.
   - (U) Completed Linear Solid State Amplifier (LSSA) development.
   - (U) Began modification of existing facility for processing of DSCS satellites beginning with the third launch in FY 1992.
   - (U) Continued low level RDT&E of DSCS communications technology.
   - (U) Continued development and implementation of fixes and improvements to satellites in storage, prior to launch.

2. (U) FY 1992 Planned Program:
   - (U) Launch three IABS-equipped DSCS satellites on ATLAS-II booster.
   - (U) Begin activation of two DSCS satellites for launch in FY 1993.
   - (U) Incorporate solid state amplifiers on DSCS IIIB-10 for launch (Flight #4) 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) Complete facility modifications for DSCS processing facility.

Program Element: #0303110F | Project Number: 0001
PE Title: Defense Satellite Communications System (DSCS) | Budget Activity: #5 - Intelligence & Communications

3. (U) FY 1993 Planned Program:
   - (U) Launch two IABS-equipped DSCS satellites on ATLAS-II booster.
   - (U) Begin activation of one DSCS satellite for launch in FY 1994.
   - (U) Prepare for FY 1995 SHF Replenishment (DSCS-R) Program. Prepare Request for Proposal (RFP) 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.

4. (U) Program to Completion:
   - (U) This is a continuing program. Continue launch of DSCS III satellites in storage using ATLAS-II/IABS.
   - (U) Initiate SHF Replenishment Program.

D. (U) WORK PERFORMED BY: AF Space Systems Division (SSD), 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 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: DSCS III/ATLAS II Flight #1 delayed from Third Quarter of FY 1991 to Second Quarter of FY 1992. DSCS III Flight #2 delayed from Fourth Quarter of FY 1991 to Third Quarter of FY 1992. DSCS Flight #3 delayed from First Quarter of FY 1992 to Fourth Quarter of FY 1992. Delays were due to commercial Atlas Centaur failure and Atlas inertial navigation unit (INU) parts contamination.
3. (U) COST CHANGES: Reprogramming action in FY 1991 of $3.0 million funded an alternative tank design to preclude downstream production yield problems on IABS #5-10 and contractor cost growth in overhead charges and new Florida taxation on the DSCS hazardous processing facility (DPF) at Cape Canaveral, FL.

F. (U) PROGRAM DOCUMENTATION:
   - (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.

Program Element: #0303110F Project Number: 0001
PE Title: Defense Satellite Communications System (DSCS) Budget Activity: #5 - Intelligence & Communications

- (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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 63,917 | 55,542 | 25,471 | Cont | TBD |

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: "Memorandum of Understanding" (MOU) between US and United Kingdom on " ...ed 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
   SHF Replenishment — 1st Qtr FY 2000
2. (U) Satellite Launches

| | | |
|---|---|---|
| DSCS III/ATLAS-II | FLT 1 - 3 | FY 1992 |
| | FLT 4 - 5 | FY 1993 |
| | FLT 6 | FY 1994 |
| | FLT 7 | FY 1995 |
| | FLT 8 | FY 1996 |
| | FLT 9 | FY 1997 |
| | FLT 10 | FY 1998 |
| SHF Replenishment | FLT 1 | FY 2000 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2022 Automated Digital Communications Processing Techniques | 1,319 | 2,848 | 2,450 | Cont | TBD |
| 2155 Systems Control | 1,239 | -0- | -0- | -0- | 31.7 |
| 2157 Transmission Improvements | 800 | 800 | 800 | Cont | TBD |
| 2206 Digital European Backbone | 180 | 180 | 150 | -0- | TBD |
| Total | 3,538 | 3,828 | 3,400 | 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 Information Systems Agency (DISA). This program is the Air Force portion of the Tri-service RDT&E program for communications networks. DISA 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 FY 1993:

1. (U) Project: 2022, Automated Digital Communications Processing: This project develops systems to provide interoperability, survivability, and control for communications networks ranging in scope from Base Communications to the global Defense Information Systems Network (DISN). A major portion of this program is the development of state-of-the-art technology in support of the Defense Message System (DMS) Target Architecture and Implementation Strategy (TAIS). 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. This program will develop and demonstrate a communications network which will provide multi-level security (MLS)(Phase II-TAIS); survivable and integrated voice, data, messaging and video services (Phase III-TAIS); tactical/strategic interfaces (Phase II-TAIS); and policy-based, international messaging (Phase III-TAIS); for command and control systems.

(U) FY 1991 Accomplishments:

- (U) Continued definition of Integrated Services Digital Network (ISDN) and initiated definition of Broadband ISDN

architecture for Secure, Survivable Communications Networking in support of DMS TAIS Phases II & III.
- (U) Completed man-machine interface for the Communications Network Operating System (CNOS) prototype to be used in the intelligent network management/control system.
- (U) Completed DMS AUTODIN/DDN interface.

(U) FY 1992 Planned Program:
- (U) Complete CNOS design and integrate in Secure, Survivable Communications Network.
- (U) Begin development of integrated switching fabric supporting DMS TAIS Phase III and MLS security mechanism supporting TAIS-Phase II.
- (U) Continue investigation of automated artificial intelligence (AI) applications, transferred from Project 2155.
- (U) Complete development of Machine Intelligent Technical Controller (MITEC) prototype and transition to AFCC & DISA. MITEC transferred from Project 2155.

(U) FY 1993 Planned Program:
- (U) Continue development of integrated switching fabric and MLS.
- (U) Begin development of survivable protocols for Secure, Survivable Communications Network.
- (U) Begin International Policy-based messaging interface for the DMS.
- (U) Continue AI and expert systems investigation.

(U) Work Performed By: All tasks in this program are managed through Rome Laboratories, Griffiss AFB, NY and Electronic Systems Division, Hanscom AFB, MA. Contractors include: 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.

(U) Related Activities:
- (U) PE 0603617F - $C^3$ 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. RL 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. RL 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 1991 Accomplishments:
- (U) Continued development of MITEC prototype.
- (U) Continued investigating interface between DPAS Network Control prototype and MITEC.
- (U) Continued development of distributed Artificial Intelligence for communication network management.
- (U) Initiated Cooperative Intelligent Systems For Communication Network Management task under RL Artificial Intelligence Program.
- (U) Project 2155 administratively combined with Project 2022.

(U) FY 1992 Planned Program: Not applicable.

(U) FY 1993 Planned Program: Not Applicable.

(U) Work Performed By: All tasks in this program are managed through Rome Laboratories, Griffiss AFB, NY and Electronic Systems Division, Hanscom AFB, MA. Contractors include: 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.

(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 addresses deficiencies and problems in multichannel communications for fixed communications, as well as mobile and TRI-TAC applications. Efforts are also focused on resolving problems inherent in the conversion to digital communication, such as bandwidth conservation and data rate compatibility.

(U) FY 1991 Accomplishments:
- (U) Initiated effort to add fiber optics to the Digital Interface Device (DID-formerly called Applique) and conduct acceptance tests.

Program Element: #0303126F Budget Activity: #5 - Communications and Intelligence
PE Title: Long Haul Communications

- (U) Initiated design of DID to allow TRI-TAC to operate over public switched networks (Common Carrier).
- (U) Completed SENTRY HUSKY exercise to demonstrate temporary restoral of damaged portions of the public switched network using TRI-TAC assets.

(U) FY 1992 Planned Program:
- (U) Complete design of Common Carrier/TRI-TAC DID.
- (U) Initiate development of Exploratory Development Model (EDM) to provide compatibility and interoperability between TRI-TAC and Strategic Terrestrial DCS with no other equipment modifications.

(U) FY 1993 Planned Program:
- (U) Begin development of a standard interface between existing military communication hardware and Integrated Services Digital Network (ISDN) to ensure information connectivity beyond 1995.

(U) Work Performed By: All tasks in this program are managed through Rome Laboratories, Griffiss AFB, NY and Electronic Systems Division, Hanscom AFB, MA. Contractors include: Harris Corp., Melbourne, FL; Signatron Inc, Lexington, MA; Motorola, Scottsdale, AZ; and Raytheon, Sudbury, MA; and National Communications Systems, Washington DC.

(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 1991 Accomplishments:
- (U) Maintained engineering to activate the 59 DCS installations.

Program Element: #0303126F Budget Activity: #5 - Communications and Intelligence
PE Title: Long Haul Communications

(U) FY 1992 Planned Program:
- (U) Maintain engineering to activate the 12 DCS installations.

(U) FY 1993 Planned Program:
- (U) Maintain engineering to activate the last 8 DCS installations.

(U) Work Performed By: All tasks in this program are managed through Electronic Systems Division, Hanscom AFB, MA. Contractors include: MITRE Corp., Bedford, MA; and Computer Engineering Associates, Avon, MA.

(U) Related Activities: (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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0303131F Budget Activity: # 2 - Strategic Programs
PE Title: Minimum Essential Emergency Communications Network (MEECN)

A. (U) RESOURCES (S in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2834 Ground Wave Emergency Network (GWEN)/Dual Frequency MEECN Receiver (DFMR) | 250 | 7,283 | 917 | 812 | 270,487 |
| 2832 Very Low Frequency/Low Frequency (VLF/LF) Improvements | 9,206 | 12,823 | 9,783 | Cont | TBD |
| Total | 9,456 | 20,106 | 10,700 | 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 (JCS), who is responsible for delivering the National Command Authority's decision in a precise and timely manner to execute or terminate actions of our nuclear capable forces. MEECN consists of communications systems specifically designed to provide assured communications connectivity. The program has a hard requirement for 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 III site, completion of the DFMR portable DT&E, start of DT&E for the High Power Transmit Set (HPTS) for the E-4B aircraft (modification of Navy E-6 design) and completion of DT&E for the Miniature Receive Terminal (MRT).

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

(U) Project 2834, GWEN/DFMR: The GWEN project defines, develops, tests, and deploys a proliferated ground wave communications system. This system provides U.S. combat 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 GWEN Thin Line Connectivity Capability (TLCC) is the prototype network providing connectivity between national command centers, warning sites, and bomber/tanker bases. The follow-on phase, the Relay Node Network Expansion (RNNE) effort, expands the total number of relay node sites from 56 to 96 and adds additional users. Planned completion of GWEN RNNE (and Full Operational Capability) is in the mid-1990's. Combat force commanders and units (equipped with EMP-hardened, secure radio equipment) interact with nearby relay nodes for participation in the network. DFMR will provide combat forces the ability to simultaneously receive Higher Authority communications from the NCA via the JCS VLF/LF and GWEN LF systems. DFMR is planned for integration in Minuteman III and future missile system launch control centers. A portable DFMR is being developed for transport and rapid setup at dispersal bases.

Program Element: # 0303131F Budget Activity: # 3 - Strategic Programs
PE Title: Minimum Essential Emergency Communications Network (MEECN)

(U) FY 1991 Accomplishments:
- (U) Conducted DFMR Critical Design Reviews (Minuteman III and portable configurations).
- (U) Stored hardware for 42 remaining GWEN relay node sites (pending completion of NAS study on GWEN low frequency health effects per Congressional direction).
- (U) Continued GWEN relay node pre-construction work.

(U) FY 1992 Planned Program:
- (U) Complete DFMR Test Readiness Review and System Test.
- (U) Complete DFMR DT&E and IOT&E.
- (U) Integrate DFMR into a Minuteman III site (first time integration).
- (U) Continue GWEN hardware storage and site preparation work to October 1992 per Congressional direction. (Increase to total program costs of $9.0M).

(U) FY 1993 Planned Program:
- (U) Begin installation of DFMR units.
- (U) Complete residual tasks.

(U) Work Performed By: Air Force System Command's Electronic Systems Division, located at Hanscom AFB, MA, has managerial responsibility. The major GWEN contractor is Contel, Fairfax, VA. DFMR prime contractor is Westinghouse Electric Corporation, Defense & Electronic Systems Division, Baltimore, MD. Mitre Corporation, Burlington, MA, and Analytical Systems Corporation, Bedford, MA, provide system engineering support.

(U) Related Activities:
- (U) Program Element #0604312F, ICBM Modernization (Rail Garrison), provided additional RDT&E FY 90/91 funding for Dual Frequency MEECN Receiver development.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):
- (U) Procurement (BA 83):

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost* | 0 | 0 | 33,424 | 3,671 | 122,495 |

*Initial spares funding not included.

- (U) Procurement, PE 11213 (BA 14):

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost* | 0 | 3,900 | 13,300 | 100,900 | 118,100 |

*Initial spares funding not included.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0303131F — Project Number: # 2832
PE Title: Minimum Essential Emergency Communications Network (MEECN) — Budget Activity: # 3 - Strategic Programs

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

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Very Low Frequency/Low Frequency (VLF/LF) Improvements | 9,206 | 12,823 | 9,783 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
Project consists of improvements to our VLF/LF communication systems to extend range, improve interservice connectivity, 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 transmissions on EC-135 and E-4B airborne command post aircraft [High Power Transmit Set (HPTS)]. HPTS is a joint-service effort with the Navy as lead. It includes continuing assessment of enhancements and improvements in the VLF/LF communications area.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) EC-135 HPTS flight test program stopped, rephased.
   - (U) EC-135 HPTS Engineering Development Model testing completed.
   - (U) Transitioned MRT production line from the Rockwell Salt Lake City to the Rockwell El Paso manufacturing facility.
   - (U) Completed MRT alternate time source development.
   - (U) Completed MRT retrofit printer development.
   - (U) Completed numerous successful MRT production reliability acceptance tests.
   - (U) Continued the MRT Field Reliability Growth Test.

2. (U) FY 1992 Planned Program:
   - (U) Complete EC-135 HPTS Single Trailing Wire Antenna Study.
   - (U) Begin E-4B HPTS DT&E (modification of Navy E-6 HPTS design).
   - (U) Begin HPTS Reliability Demonstration Test.
   - (U) Complete MRT Field Reliability Growth Test.
   - (U) Initiate delivery and installation of B-1B MRT production assets.
   - (U) Complete MRT Program Management Responsibility Transfer to WR-ALC.

3. (U) FY 1993 Planned Program:
   - (U) Complete E-4B HPTS DT&E. Increase in funding to complete this effort. Revised program estimate based on Navy design and flight test work and scope of required changes for integration with the E-4B aircraft.
   - (U) MRT residual tasks (as defined by Program Management Responsibility Transfer).

Program Element: # 0303131F Project Number: # 2832
PE Title: Minimum Essential Emergency Communications Network (MEECN) Budget Activity: # 3 - Strategic Programs

4. (U) Program to Completion:
   - (U) EC-135 HPTS DT&E (FY 95 completion).
   - (U) Air Force support to on-going MEECN improvements continues and includes support for interoperability issues and testing, threat studies, new VLF/LF modes and VLF/LF system improvements.

D. (U) WORK PERFORMED BY: Rockwell International, Richardson, TX (MRT and HPTS); Analytical Systems Engineering Corporation, Burlington, 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 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Delay in completion of MRT Field Reliability Growth Test (FRGT) for proof of mean-time-between-failure requirement from FY 91 to FY 92. Completion was Dec 91. Contract MTBF requirement was met. Phase II effort for EC-135 HPTS Program to cover installation and aircraft test was delayed from FY 91 to FY 94 because of insufficient funds.
3. (U) COST CHANGES: Project funding increase from FY 1991 to 1992 required for start of DT&E for the HPTS on the E-4B aircraft (modification of Navy E-6 design) and completion of DT&E for the MRT. FY 93 funding estimate increased to allow completion of E-4B HPTS DT&E effort based on revised Navy program estimates for equipment and revised estimate of design effort required for successful E-4B installation and integration.

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 #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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | - | - | - | - | 47,500 |

| (B-52H MRT) | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 259 | 68 | 164 | 90 | 33,081 |

Program Element: # 0303131F
PE Title: Minimum Essential Emergency Communications Network (MEECN)
Project Number: # 2832
Budget Activity: # 3 - Strategic Programs

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| (E-4B HPTS) Cost | - | - | - | 53 | 53 |
| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
| (EC-135 HPTS) Cost | - | - | - | 130 | 130 |

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) MILESTONE SCHEDULE:

1. (U) MRT Milestones:

| | |
|---|---|
| Contract Award | Jun 85 |
| IOT&E Complete | Jul 89 |
| Field Reliability Growth Test Complete | Dec 91 |
| PMRT to WR-ALC | Apr 92 |

2. (U) HPTS Milestones:

| | |
|---|---|
| Contract Award (Combined Development) | May 87 |
| AF Development Model Testing Complete | Sep 91 |
| Navy E-6 Flight Testing Start | Dec 91 |
| AF E-4 DT&E Complete | FY 93 |
| AF EC-135 DT&E Complete | FY 95 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303144F
PE Title: Electromagnetic Compatibility Analysis Center
Project Number: 0001
Budget Activity: #5 - Intelligence & Communications

A. (U) RESOURCES ($ in Thousands)

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Electromagnetic Compatibility Analysis Center (ECAC) Total | 10,087 | 10,188 | 10,159 | 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. The function of the Center is to provide electromagnetic compatibility (EMC) support to ASD, JCS, and the military departments. ASD/JCS directed 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, other Services, and CINCs worldwide. The program is required to guarantee optimum use of the spectrum throughout the world. ECAC Operational Planning support provides Service, JCS, and CINC planners with information describing the C-E infrastructure for countries and regions specified by JCS. ECAC responsibilities also include support to the Air Force and other Services in designing, developing, and acquiring communications-electronics (C-E) equipment supporting C3I and electronic warfare (EW), that will operate compatibly with other systems in strategic or tactical operations. 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. This program provides the technical data and analysis models for use in analysis of over 200 DOD programs supported by ECAC. To assure the compatible operation of C-E systems in their intended operational environment, the ECAC provides support to system acquisition program management offices, operational commanders, and frequency managers on a cost reimbursement basis. C-E Systems Acquisition support provides Air Force and other Service system acquistion managers with frequency supportability and EMC guidance during the development, procurement, deployment of C-E systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Supported DESERT SHIELD/STORM with frequency management and communications planning support.

Program Element: #0303144F
PE Title: Electromagnetic Compatibility Analysis Center

Project Number: 0001
Budget Activity: #5 - Intelligence & Communications

- (U) Connected to DOD Intelligence Information System (DODIIS)
- (U) Integrated NATO data formats into the FRRS.
- (U) Established the FRRS configuration control board.
- (U) Reviewed and provided EMC evaluations on Service requests for Equipment Frequency Allocation for 100 C-E systems being developed or fielded by the Services.
- (U) Managed/maintained/operated the FRRS and DOD EMC Data Base.
- (U) Evaluated interface between Joint Spectrum Management System (JSMS) and the FRRS.

2. (U) FY 1992 Planned Program:
   - (U) Develop interface between FRRS with host government data.
   - (U) Manage/maintain/operate the FRRS and DOD EMC Data Base.
   - (U) Initiate ECAC contingency planning support cell.
   - (U) Develop interfaces to integrate the Service developed Battlefield Spectrum Management Systems and the FRRS.
   - (U) Add frequency allocation evaluation capability to the FRRS.
   - (U) Develop a "Proof of Concept" FRRS platform utilizing an Open System Architecture.
   - (U) Review and evaluate approximately 100 Service requests for Frequency Allocation for C-E systems in various stages of development and deployment.

3. (U) FY 1993 Planned Program:
   - (U) Start conversion of the distributed data base portion of the FRRS to an Open System Architecture.
   - (U) Complete development and fielding of operational JSMS to CINCS.
   - (U) Manage/maintain/operate the FRRS and DOD EMC Data Base.
   - (U) Review and comment to the Services on the development and deployment of new C-E systems.

5. (U) Program to Completion:
   - (U) This is a continuing program. PE 0303144 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.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None

2. (U) SCHEDULE CHANGES: DESERT SHIELD/STORM Operational Planning Support deferred to FY92 the addition of frequency allocation evaluation capability to the FRRS.

3. (U) COST CHANGES: FY 1991 reductions were restored during execution year to budget year levels and more. This was as a result of reprogrammings, and denial of this program as source for other priorities.

Program Element: #0303144F
PE Title: Electromagnetic Compatibility Analysis Center

Project Number: 0001
Budget Activity: #5 - Intelligence & Communications

F. (U) PROGRAM DOCUMENTATION:
(U) DOD Directive 3222.3 and DOD Instruction 5000.2, Part 6, Section G. All reprogrammings to ECAC's PE funds require ASD/C3I and JCS coordination.

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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|
| 6,984 | 6,707 | 6,649 | Cont. | TBD |

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE:

| | | | |
|---|---|---|---|
| 1. | (U) | Completed interface with NSA SOI | Sep 1990 |
| 2. | (U) | Extended FRRS to CINCEUR, Japan, Korea | Sep 1990 |
| 3. | (U) | Support DESERT STORM | Mar 1991 |
| 4. | (U) | Connect to DODIIS | Sep 1991 |
| 5. | (U) | Interface FRRS with host government data | Sep 1992 |
| 6. | (U) | Initiate ECAC contingency planning support cell | Sep 1992 |
| 7. | (U) | Develop interfaces to integrate Service developed BSMS and the FRRS. | Sep 1992 |
| 8. | (U) | Start conversion of distributed FRRS to an Open System Architecture. | Aug 1993 |
| 9. | (U) | Complete development and fielding of operational JSMS to CINCS | Sep 1993 |
| 10. | (U) | Add artificial intelligence/expert systems to the FRRS. | Sep 1993 |

FY 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3155 USAF WWMCCS ADP Modernization (AFWAM) Program | | | | | |
| | 1,504 | 560 | 0 | 0 | 23,339 |
| Total | 1,504 | 560 | 0 | 0 | 23,339 |

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 1991 Accomplishments:
- (U) Installed local area networks and workstations at 3 sites to include a major installation at the Keesler AFB training facility
- (U) Completed the transfer of the WWMCCS Workstation contract administration program from ESD to AFCC/SSC
- (U) Received official approval from the JCS authorizing the operational use of the AFWAM LAN in the WWMCCS environment
- (U) Submitted remote connectivity, security software, and enhanced network communications equipment system development notification (SDN) requests to the JCS

(U) FY 1992 Planned Program:
- (U) Continue through to completion the installation of local area networks at the remaining nine AF operational sites.
- (U) Continue integration efforts between Joint and Air Force software systems to enhance security and capacity of the LANs.

(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.

Program Element: #0303152F Budget Activity: 3- Strategic Programs
PE Title: WWMCCS Information System

(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 3 ):

| FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|
| 7,300 | 6,500 | 0 | Cont. | TBD |

(U) International Cooperative Agreements: Not applicable.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Communications Security | 5,697 | 12,774 | - | 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 COMSEC program addresses problems encountered in adapting general purpose cryptographic equipment for use in Air Force communications and computer systems. The four general information security R&D areas covered by this program are: communications security, TEMPEST, computer security, and secure voice R&D. Initiatives are closely coordinated with the programs and requirements of the National Security Agency, Defense Information Systems Agency, the Army , and the Navy. This minimizes the possibility of duplication and provides for technology transfer/transition in support of Joint and specific Air Force C3I requirements. 18 new Statements of Need are being validated to satisfy multiple MAJCOM requirements.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Completed analysis of malicious code in distributed systems.
   - (U) Developed Serial Signal Breakback algorithm for TEMPEST signal extraction as part of the Computer Assisted Analysis System (CAAS).
   - (U) Completed CYPRIS COMSEC key generation software simulation program.
   - (U) Developed software digital filter technique for extracting pulse-type signals from heavy noise environments for the wideband digital recording system.
   - (U) Developed non-real-time narrowband secure voice conferencing system.
   - (U) Completed development of Air Force Electronic Key Distribution System.
   - (U) Filed Air Force patent on Narrowband Multi-speaker Conferencing.
   - (U) Continued Multi-Level Secure (MLS) product development.

2. (U) FY 1992 Planned Program:
   - (U) Deliver INFOSEC laptop workstation to HQ MAC.
   - (U) Deliver B2 MLS Database Management System and transition to HQ AFIC Cryptologic Support Center for evaluation.
   - (U) Complete MLS Database Integrity Formal Policy model.
   - (U) Demonstrate THETA B1 Distributed Operating System.
   - (U) Design and test TEMPEST signal extraction technique for non-

Program Element: #0303401F Budget Activity: 5-Intelligence &
PE Title: Communications Security (COMSEC) RDT&E Communications

white, non-gaussian noise signals.
- (U) Complete real-time narrowband multi-speaker conferencing demonstration and initiate development for 2.4 & 1.2 Kbps rates.
- (U) Initiate development of a high quality 2.4 Kbps secure voice system for HQ SAC.
- (U) Continue MLS product development.
- (U) Complete development of electromagnetic remanence detection prototype.

3. (U) FY 1993 Planned Program:
- (U) Complete high-speed COMSEC encryption trade-off analysis.
- (U) Complete MLS distributed system integrity model.
- (U) Complete MLS Intrusion Detection prototype system development.
- (U) Initiate BLACKER Interface Device Critical Experiment.
- (U) Initiate MLS generic guard development.
- (U) Continue Multi-Level Secure product development and establish a Security Transition Analysis Facility (STAF) to evaluate vendor commercial products.
- (U) Increase over FY 92 funding is necessary to address consolidated MAJCOM requirements for Computer Security.

4. (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. ; Arcon Corp., Bedford, MA.; and Massachusetts Institute of Technology, Boston, MA; ORA Corp.,Ithaca NY; SRI International, Menlo Park CA; MITRE Corp., Bedford MA; Infosystems Technology, Inc., Greenbelt MD; and Trusted Information Systems, Inc., Glenwood MD.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

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

F. (U) PROGRAM DOCUMENTATION:

- (U) TAF SON 738-88C1, Multilevel Security for C3I Systems (U).
- (U) ESC SON 013-89C1, COMFY ASH (S-NF-W).
- (U) SAC SON 000-89C1, Secure Database System (S-NF-W).
- (U) SAC SON 000-89C1, Secure Management of Aggregation of Data (S-NF-W).
- (U) SAC SON 000-89C1, Classified Material Control System (S-NF-W).
- (U) AFMPC SON 000-089C1, Personnel Records Security System (S-NF-W).
- (U) ESC SON 008-89C1, Advanced NONSTOP Test Set (S-NF-W).

Program Element: #0303401F Budget Activity: 5-Intelligence &
PE Title: Communications Security (COMSEC) RDT&E Communications

- (U) ESC SON 012-89C1, Computer Assisted Signal Analysis Technology Program (S-NF-W).
- (U) ESC SON 009-89C1, Broadband Time Domain Signal Collection System (S-NF-W).
- (U) ESC SON 011-89C1, Wideband Recorder/Player (S-NF-W).
- (U) ESC SON 010-89C1, SHF/EHF Test System (S-NF-W).
- (U) AFSPACECOM (pending), Handheld Secure Radios (U).
- (U) AFWL (pending), High Speed Key Generation Devices (U).
- (U) ESC SON 002-90, Acoustic Energy Retrieval/Measurement System (S-NF-W).
- (U) AFSPACECOM SON 000-90, Secure Hand-Held Cellular Telephone (S-NF-W).
- (U) ESC SON 001-90, Advanced Demodulator (S-NF-W).
- (U) AFSC SON 000-89, High-Speed Crypto Generator (S-NF-W).
- (U) AFLC SON 002-90, Network Security System (NSS) (U).
- (U) ESC SORD 838-88-I, MLS for MAC Command and Control Automated Systems, MLS Information Flow Control Subsystem for AFLC Automated Information Systems, and MLS for ESC Intelligence Data Handling Systems (U).
- (U) ESC SORD 000-00-I, MLS for TAF Unit Level Theater Battle Management System and MLS for the Air Force Flight Test Center (AFFTC) (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.
- (U) Program Element #0305167G, Computer Security Program (CSP), is responsible for generic COMPUSEC R&D.
- (U) Program Element #063215C is responsible for SDI-related INFOSEC R&D.

H. (U) OTHER APPROPRIATION FUNDS ($ IN THOUSANDS): Not Applicable.

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

J. (U) MILESTONE SCHEDULE:

1. (U) Field prototype electromagnetic remanence detection and elimination work stations. 2nd Qtr FY 1993
2. (U) Field B2 MLS Database Management System 3rd Qtr FY 1993
3. (U) Field B2 MLS Distributed Operating System 2nd Qtr FY 1994

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303601F
PE Title: Milstar Satellite Communications System
Project: #2487
Budget Activity: #3 - Strategic Programs
Project Title: Milstar

POPULAR NAME: Milstar

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

| BUDGET ($000) | FY 1991 | FY 1992 | FY 1993 | TO COMPLETE |
|---|---|---|---|---|
| Major Contract | 632,700 | 878,297 | 1,127,839 | 6,875,186 |
| Support Contract | 29,700 | 72,085 | 63,456 | 364,816 |
| In-House Support | 5,700 | 27,056 | 27,491 | 530,275 |
| GFE/ Other | 41,900 | 62,178 | 43,110 | 219,740 |
| Total | 710,000 ** | 1,039,616 * | 1,261,896 | 7,990,017 |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | To Complete |
| Program Milestones | N/A | DAB Review May 92 | N/A | Sat/LCT Term MS III 1QTR FY99/4QTR FY97 |
| Engineering Milestones | DFS-1 Integration Nov 90 | First LRIP Terminal Delv Aug 92 | DFS-1 Sat Delivery Dec 92 | Continue with follow on Sat/Term |
| T&E Milestones | DFS-1 Integrated Test Jun 91 | Intersegment Test May 92 | Terminal IOT&E Jul 93 | System IOT&E 4QTR FY95 |
| Contract Milestones | MDR Arch Jun 91 | DFS-4-8/MDR MD Jul 92, LCT DEM/VAL Jan 92 | N/A | Prod- LCT 1QTR FY97, Sat 2QTR FY00 |

* NOTE: In PE 0303601F and PE 0303603F
** NOTE: In PE 0603710D

Program Element: #0303601F
PE Title: Milstar Satellite Communications System
Project: #2487
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 Extremely High Frequency (EHF) satellites, satellite mission control segment, and new or modified communication 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.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
- (U) Completed Development Flight Satellite (DFS)-1 integration.
- (U) Began DFS-1 first article qualification testing.
- (U) Continued development/fabrication of DFS-2, and 3.
- (U) Began development of the architecture for the Medium Data Rate (MDR) system.
- (U) Continued development for the Mission Control Element (MCE).
- (U) Began development of the Milstar Mobile Constellation Control Station (MMCCS).
- (U) Completed the EHF Core terminal development.
- (U) Continued Core terminal Engineering Change Orders (ECOs).
- (U) Continued Engineering Development Model (EDM) Core terminal fabrication and installation in EC-135C aircraft and selected ground locations.

2. (U) FY 1992 Planned Program:
- (U) Continue DFS-1 first article qualification tests.
- (U) Begin DFS-2 integration.
- (U) Continue development/fabrication of DFS-3.
- (U) Complete development of the architecture for the MDR system.
- (U) Begin Engineering and Manufacturing Development (EMD) of DFS-4 with Low Data Rate (LDR) and MDR payloads.
- (U) Begin installing EDM MCEs.
- (U) Complete development of the MMCCS.
- (U) Continue Core terminal ECOs.
- (U) Complete fabrication of EDM Core terminals .
- (U) Continue installation of EDM Core terminals into EC-135C aircraft and select ground sites.
- (U) Begin Demonstration/Validation (DEM/VAL) of the Low Cost Terminal (LCT).

3. (U) FY 1993 Planned Program:
- (U) Deliver and launch DFS-1.
- (U) Complete integration of DFS-2.
- (U) Begin DFS-2 testing.
- (U) Begin DFS-3 integration.
- (U) Continue EMD of DFS-4
- (U) Begin fabrication of LDR and MDR payloads and satellite bus.
- (U) Continue installing EDM MCEs.
- (U) Field the EDM MMCCS.
- (U) Continue Core terminal ECOs.

Program Element: #0303601F Project: #2487
PE Title: Milstar Satellite Communications System Budget Activity: #3 - Strategic Programs

3. (U) FY 1993 Planned Program (Cont.):
   - (U) Complete installation of EDM Core terminals into EC-135C aircraft and select ground sites.
   - (U) Continue DEM/VAL of the LCT.
4. (U) Program to Completion:
   - (U) Deliver and launch DFS-2 & 3.
   - (U) Complete EMD and integration of DFS-4's MDR payload.
   - (U) Deliver DFS-4.
   - (U) Develop, fabricate, and deliver DFS-5, 6, 7, and 8.
   - (U) Complete installation of EDM MCEs.
   - (U) Complete Core terminal ECOs.
   - (U) Begin and complete EMD of LCT.

D. (U) WORK PERFORMED BY: The development of the Milstar space, mission control segment, and Air Force terminal segments is managed by a program office located at 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. Milstar satellites and MCEs are developed by Lockheed Missiles & Space CO., Sunnyvale, CA. Milstar terminals are developed by Raytheon Company, Sudbury, MA and Rockwell International, Dallas, TX. Systems Engineering and technical support is provided by the Aerospace Corporation, El Segundo, CA, MITRE Corporation, Bedford, MA, and Lincoln Laboratory, Bedford, MA.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: No Change.
2. (U) SCHEDULE CHANGES: EMD of LCT slipped from late FY93 to early FY94. There is no cost or schedule impact.
3. (U) COST CHANGES: No Change.

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)
2. (U) Test and Evaluation Master Plan (TEMP), 18 Apr 90
3. (U) System Operational Requirements Document (SORD), 27 Mar 89

G. (U) RELATED ACTIVITIES:

1. (U) PE 0101126F (B-1B)
2. (U) PE 0101127F (B-2)
3. (U) PE 0101213F (Minuteman Squadrons)
4. (U) PE 0101312F (Post Attack Command and Control System/Worldwide Command Post, EC-135C/H/J/P)
5. (U) PE 0302015F (National Emergency Airborne Command Post, E-4B)
6. (U) PE 0305119F (Space Boosters)
7. (U) PE 0604577N (EHF Satellite Communications)
8. (U) PE 0303109N (Satellite Communications)
9. (U) PE 0303603N (Milstar Satellite Communications System)
10. (U) PE 0303142A (Tactical Communications Ground Environment)
11. (U) There is no unnecessary duplication of effort within AF or DoD.

Program Element: #0303601F Project: #2487
PE Title: Milstar Satellite Communications System Budget Activity: #3 - Strategic Programs

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

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| (U) Aircraft Procurement (BA 10) | | | | | |
| Cost | 32,500* | 0,000 | 15,600 | 503,000 | 715,200 |
| Spares | 0,000 | 0,000 | 2,041 | 77,800 | 107,000 |
| (U) Other Procurement (BA 16) | | | | | |
| Cost | 149,100* | 263,907 | 211,470 | 601,500 | 1,365,300 |
| Spares | 31,400* | 56,424 | 60,517 | 156,300 | 348,300 |
| (U) Missile Procurement (BA 14) | 0,000 | 0,000 | 0,000 | 8,968,500 | 8,968,500 |
| (U) Military Construction (BA 24) | | | | | |
| Cost | 2,060 | 12,350 | 0,000 | 142,100 | 161,800 |

* NOTE: In OSD C3I procurement account

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

| EVENT | DATE | RESULTS |
|---|---|---|
| - 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 |
| - Terminal/MCE Interface | Apr 91 | Verified Terminal and MCE fixes |

T&E ACTIVITY (TO COMPLETION)

| EVENT | PLANNED DATE | REMARKS |
|---|---|---|
| - Phase IV Interoperability DEMO | FY92 | |
| - Phase I & II MCE/MCC Interface | FY92 | |
| - Multi-Service IOT&E Phase I | FY93 | |
| - Multi-Service IOT&E Phase II | FY94 | |

FY 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3163 UHF Satellite Terminal System (USTS) | 3,330 | 926 | 0 | | 23,900 |
| 3164 Ground Mobile Forces Satellite Communications (GMFSC) | 2,602 | 417 | 2,493 | Continuing | TBD |
| XXX1 Single Channel Transponder System (SCTS) | 0 | 564 | 1,507 | Continuing | TBD |
| Total | 5,932 | 1,907 | 4,000 | 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 1991 Accomplishments:
- (U) Continue development of the Network Contol System (NCS) with a Type I TRANSEC and interoperable 5 KHz and 25KHz DAMA schemes.
- (U) Begin competition for NCS with Type I TRANSEC.

(U) FY 1992 Planned Program:
- (U) Continue development of the NCS with a Type I TRANSEC.
- (U) Achieve production decision of NCS.

(U) FY 1993 Planned Program:
- (U) Award production contract for NCS.
- (U) Initiate testing of the NCS.

Program Element: #0303605F Budget Activity: #4 - Tactical Programs
PE Title: Military Satellite Communications (MILSATCOM) Terminals

(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: Not Applicable

(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.

(U) FY 1991 Accomplishments:
- (U) Initiated Source Selection and awarded two (2) contracts to GE Aerospace and Harris Corporation for the demonstration/validation program for the SHF Portable Terminal System (PTS) lightweight manpack satellite terminals.

(U) FY 1992 Planned Program:
- (U) Complete demonstration/validation for the SHF PTS lightweight manpack satellites.

(U) FY 1993 Planned Program:
- (U) Initiate study of a SHF Demand Assigned Multiple Access (DAMA) standard.

(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.

Program Element: #0303605F Budget Activity: #4 - Tactical Programs
PE Title: Military Satellite Communications (MILSATCOM) Terminals

(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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 11,983 | 7,974 | 10,194 | Cont | TBD |

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project XXX1, 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 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 1991 Accomplishments: 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.

Program Element: #0303605F Budget Activity: #4 - Tactical Programs
PE Title: Military Satellite Communications (MILSATCOM) Terminals

(U) Other Appropriation Funds:

Other Procurement (BA 3):

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 2,700 | 0 | 0 | Cont | TBD |

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305110F
PE Title: Satellite Control Network (SCN)
Budget Activity: #6-Defense Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3276 Air Force Satellite Control Network (AFSCN) | 91,918 | 92,710 | 89,540 | Cont | TBD |
| 3988 Funding Transfer | 323 | 0 | 0 | 0 | 323 |
| 3186 Automated Remote Tracking Station (ARTS) | 23,311 | 19,857 | 14,760 | 0 | 57,928 |
| Total | 115,552 | 112,567 | 104,300 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Air Force Satellite Control Facility (AFSCF) has evolved into the Air Force Satellite Control Network (AFSCN), a global network of communications and computer systems to control national security space vehicles. The AFSCN improvement and modernization project funds the development and acquisitions needed to evolve this highly reliable national satellite command and control capability to meet the requirements of the satellite systems it supports. Budget Project #3988 was a PE funding transfer within the AFSCN for FY91. The Automated Remote Tracking Station (ARTS) develops, procures, and installs advanced satellite command and control systems to increase AFSCN operational capability. ARTS equipment provides improved Tracking, Telemetry, and Commanding (TT&C) performance and reliability, lower life cycle costs associated with operations, reduces the manpower required to support the AFSCN, and improves the interoperability/ commonality with other satellite control networks. ARTS Acquisition Phase II modifies the ARTS full scale development design to meet new requirements, replaces and upgrades non-ARTS AFSCN tracking stations, provides two Transportable Vehicle Checkout Facilities (TVCF), and retrofits the initial four development sites. The Integrated Satellite Control System (ISCS) will provide the framework for an evolution of DoD satellite control systems toward an integrated, interoperable, distributed, and cost-effective capability necessary to simplify operations and reduce life cycle costs.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305110F
PE Title: Satellite Control Network (SCN)
Project Number: 3276
Budget Activity: #6-Defense Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| AFSCN | 92,241* | 92,710 | 89,540 | Cont | TBD |

* Includes $323 for budget project #3988 which was a PE funding transfer within the AFSCN in FY91.

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 1991 Accomplishments:
- (U) Provided system engineering and development of network hardware/ software modifications to meet evolving program requirements.
- (U) Continued upgrade efforts supporting transition of satellite programs from the old data systems configuration to a new computer configuration.

(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 the new computer configuration.
- (U) Deactivate Current Data System (CDS)

(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) Provide engineering/modification support to the Consolidated Space Operations Center (CSOC) operational turnover.
- (U) Complete transition of satellite programs to Mission Control Complexes at the CSOC.

(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,

Program Element: #0305110F
PE Title: Satellite Control Network (SCN)
Project Number: 3276
Budget Activity: #6-Defense Wide Mission Support

MD, provides command and control data systems sustaining engineering.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: In FY 1993, remaining Consolidated Space Operations Center (CSOC) 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: Four command and control projects slipped due to funding cut; only interim capabilities delayed.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:
- (U) Multicommand Required Operational Capability (MROC) for an Integrated Satellite Control System (ISCS), Dec 89.
- (U) AFSCN Master Development Plan (MDP), Annual Update.
- (U) AFSCN Program Management Directive 9038(17), Nov 91.

G. (U) RELATED ACTIVITIES:
- (U) Program Element 0305151F, SCN Communications.
- (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 effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

(U) Other Procurement (BA 83):

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | Total Program |
|---|---|---|---|---|
| Cost | 82,744 | 26,836 | 38,163 | TBD |

(U) Military Construction:

| | | | | |
|---|---|---|---|---|
| Funds | 4,600 | 0 | 0 | TBD |

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. | (U) Command & Data Processing Engineering Contract Award | Oct 1991 |
| 2. | (U) Complete Transition of Satellite Programs to New $C^2$ System | Mar 1992 |
| 3. | (U) Complete Operational Communications Traffic Switching System | May 1993 |
| 4. | (U) CSOC Full Operational Turnover (FOT) | Sep 1993 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305110F
PE Title: Satellite Control Network (SCN)
Project Number: 3186
Budget Activity: #6-Defense Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Automated Remote Tracking Station (ARTS) | 23,311 | 19,857 | 14,760 | 0 | 57,928 |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Develops, procures, and installs advanced satellite command and control systems to increase the operational capability of the Air Force Satellite Control Network (AFSCN). ARTS equipment provides improved Tracking, Telemetry, and Commanding (TT&C) performance and reliability, lower life cycle costs associated with operations, reduces the manpower required to support the AFSCN, and improves the interoperability/commonality with other satellite control networks. ARTS Acquisition Phase II modifies the ARTS full scale development design to meet new requirements, replaces and upgrades non-ARTS AFSCN tracking stations, provides two Transportable Vehicle Checkout Facilities (TVCF), and retrofits the initial four development sites.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Provided system engineering and development of hardware and software modifications to meet evolving program requirements.
- (U) Initiated upgrade of fourth increment of five remote tracking stations (RTS) under ARTS Acquisition Phase II contract.
- (U) Provided ARTS Diego Garcia RTS initial ops capability (IOC).
- (U) Provided ARTS New Hampshire B-side tracking station IOC.
- (U) Provided ARTS Hawaii B-side tracking station IOC.
- (U) Completed upgrade of three ARTS I configured stations to the ARTS II design

(U) FY 1992 Planned Program:
- (U) Provide system engineering and development of hardware and software modifications to meet evolving program requirements.
- (U) Complete and deliver two TVCFs, one each to the Eastern Test Range and to the Western Test Range.
- (U) Complete IOC of modernized ARTS stations at Guam side-A/B, Vandenberg side-A, and Hawaii side-A tracking stations.

(U) FY 1993 Planned Program:
- (U) Provide system engineering and development of hardware and software modifications to meet evolving program requirements.
- (U) Complete IOC of modernized ARTS stations at New Hampshire-A and Indian Ocean tracking stations.
- (U) Relocate ARTS Development and Modernization Facility from Sunnyvale, CA to permanent location in Colorado Springs, CO.
- (U) Complete ARTS full operational capability for all specified AFSCN tracking stations.

(U) Program To Completion:
- (U) Program is scheduled to be completed by FY 93.

Program Element: #0305110F
PE Title: Satellite Control Network (SCN)
Project Number: 3186
Budget Activity: #6-Defense Wide Mission Support

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 installation; 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.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Not Applicable.
2. (U) SCHEDULE CHANGES: Funding for this program was reduced causing interim delays in providing additional improvements which are not yet on contract, however, FOC remains Sep 93.
3. (U) COST CHANGES: None (ARTS is reported as a separate project).

F. (U) PROGRAM DOCUMENTATION:
- (U) Remote Tracking Stations Statement of Operational Requirements Document (SORD) and Baseline Correlation Matrix.
- (U) AFSCN Program Management Directive 9038(17), Nov 91.
- (U) ARTS Test and Evaluation Master Plan, Revision C, Oct 90.

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:

(U) Other Procurement (3080):

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | Total Program |
|---|---|---|---|---|
| Cost | 50,861 | 19,742 | 15,023 | 85,626 |

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE:

| | |
|---|---|
| - (U) ARTS Thule Tracking Station Side-B IOC | Oct 1991 |
| - (U) ARTS TCS Oakhanger Tracking Station Side-B IOC | Oct 1991 |
| - (U) ARTS Transportable Vehicle Checkout Facility #1 IOC | Jan 1992 |
| - (U) ARTS Guam Tracking Station Side-A IOC | Apr 1992 |
| - (U) ARTS Vandenberg Tracking Station Side-A IOC | Jun 1992 |
| - (U) ARTS Guam Tracking Station Side-B IOC | Aug 1992 |
| - (U) ARTS Hawaii Tracking Station Side-A IOC | Nov 1992 |
| - (U) ARTS New Hampshire Tracking Station Side-A IOC | Feb 1993 |
| - (U) ARTS Transportable Vehicle Checkout Facility #2 IOC | Aug 1993 |
| - (U) ARTS Indian Ocean Tracking Station IOC | Aug 1993 |
| - (U) ARTS Full Operational Turnover | Sep 1993 |

FY 1993 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 1991 Estimate | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2026 System Support | 556 | 476 | 714 | Cont | TBD |
| 3587 Microwave Landing Systems (MLS) Avionics | 15,207 | 11,807 | 12,086 | 14,100 | 86,100 |
| TOTAL | 15,763 | 12,283 | 12,800 | 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.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 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 1991 Accomplishments:
- (U) Continued support for all ATCALS projects.
- (U) Completed the Digital Bright Radar Indicator Tower Equipment Displays and Flight Data Input/Output projects production.
- (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) FY 1992 Planned Program:
- (U) Continue support for all ATCALS projects.
- (U) Begin DT&E and OT&E to support development of the Tower Restoral Vehicle/Surveillance Restoral Vehicle (TRV/SRV).
- (U) Interface Global Positioning System (GPS) with air traffic control (ATC) systems developing operational procedures for ATC use of GPS.

(U) FY 1993 Planned Programs:
- (U) Complete OT&E for TRV/SRV.
- (U) Support integration of Special Use Airspace and air traffic control operations.
- (U) Support field test activities, interoperability evaluations, and related technical support between DOD and FAA for ATCALS and NAS.

(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.

Program Element: #0305114F
PE Title: Air Traffic Control And Landing Systems (ATCALS)

Budget Activity: #5-Intelligence and Communications

(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.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Microwave Landing System Avionics (MLSA) | 15,207 | 11,807 | 12,100 | 14,100 | 86,100 |

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 the twenty year program to transition Air Force operations from use of Precision Approach Radars (PAR) and Instrument Landing Systems (ILS) to the international Microwave Landing System (MLS) for precision approach and landings. 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 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 for the Receiver Processor Unit).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Continued development of MMLSA
   - (U) Completed F-16 integration studies.
   - (U) Began software integration definition for F-16.
   - (U) Completed DT&E test definition.

2. (U) FY 1992 Planned Program:
   - (U) Complete MMLSA development and fabrication of Engineering and Manufacturing Development (EMD) 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.

3. (U) FY 1993 Planned Program:
   - (U) Award MMLSA first article test contract.
   - (U) Fabricate test units to support First Article Testing (FAT).
   - (U) Continue F-16 integration and kit development.

4. (U) Program to Completion:
   - (U) Start FAT T&E Mar 94 and OT&E Dec 94.
   - (U) Production decision Jun 95.
   - (U) Initial Operating Capability in FY 1997.

D. (U) WORK PERFORMED BY: The MMLSA EMD contract was awarded to Rockwell International, Cedar Rapids, Iowa; GEC/Marconi Corp, Wayne, NJ; and Hazeltine Corp, Greenlawn, NY. Three contractors were selected for EMD. Through full and open competition, two contractors will be selected for production. General Dynamics working with

Program Element: #0305114F
PE Title: Air Traffic Control And Landing Systems (ATCALS)
Project Number: # 3587
Budget Activity: # 5 - Intelligence and Communications

Aeronautical Systems Division, Wright-Patterson AFB, OH will integrate MMLSA on the F-16. Electronic Systems Division, Hanscom AFB, MA manages the MLS Avionics project.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: System acquisition schedule and IOC were adjusted outward to reflect an updated schedule.
3. (U) COST CHANGES: MMLSA development in FY 92 and FY 93 changed to match new schedule.

F. (U) PROGRAM DOCUMENTATION:

- (U) Air Force Communications Command General Operating Requirement, Advanced Military Landing System, 16 Feb 78.
- (U) PMD 2026(11)/35114F, Air Traffic Control And Landing Systems and the National Airspace System, 19 Mar 91.
- (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) PMD 4030(11)/35114F, MLS, 18 Mar 91.
- (U) MLS Acquisition Decision Memorandum, 27 Jul 89.
- (U) PMD 2212(01)/T3587, Class V Modification, Installation of Commercial MLS Avionics (CMLSA) on C-130 Aircraft, 28 Feb 91.
- (U) PMD 2218(01)/35114F, Class V Modification, Installation of MMLSA on F-16 Aircraft, 12 Mar 91.
- (U) System Operational Requirements Document (SORD) for MMLSA, 26 Jul 90.
- (U) SORD for CMLSA, 19 Mar 91.

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) MLS Avionics will be installed on C-130 (Program Element # 0401115F) and F-16 (Program Element # 0207133F) aircraft.

(U) Microwave Landing Systems support the DOD/FAA National Airspace System (NAS) program by modernizing air traffic control ground systems (NAS Program Element # 0305137F)

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

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

(U) Procurement (3010):

| Cost | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| C-130 | 10,600 | 7,823 | 9,356 | 3,900 | 43,779 |
| Other | - | - | - | 655,721 | 655,721 |
| Total | 10,600 | 7,823 | 9,356 | 659,621 | 699,500 |

Program Element: #0305114F Project Number: # 3587
PE Title: Air Traffic Control And Landing Systems (ATCALS) Budget Activity: # 5 - Intelligence and Communications

(U) Note: FY 90-94 funds integration and installation of the Commercial Microwave Landing System Avionics (CMLSA) for 670 C-130s. To Complete and Total Program reflect the procurement and installation cost for CMLSA on 1859 large aircraft and MMLSA on 5699 fighter aircraft.

(U) MILITARY CONSTRUCTION: Not Applicable.

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

J. (U) MILESTONE SCHEDULE (MMLSA):

| | | | |
|---|---|---|---|
| 1. | (U) | Milestone II | June 1989 |
| 2. | (U) | Contract Award | December 1989 |
| 3. | (U) | Early Operational Assessment | April 1992 |
| 4. | (U) | FAT T&E | March 1994 |
| 5. | (U) | Operational Test and Evaluation | December 1994 |
| 6. | (U) | Milestone III Production Decision | June 1995 |
| 7. | (U) | Production Contract | September 1995 |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Medium Launch Vehicles | 38,835* | 43,202 | 41,800 | Cont | TBD |

* Does not include $165.2M of Titan IV funding. A separate PE was established beginning FY92 for Titan IV, PE 35144F.

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. The Medium Launch Vehicles (MLV) program provides development, procurement and launch of medium class DoD ELVs. These include the Delta II and Atlas II at Cape Canaveral AFS, Florida, the Titan II, Atlas E, and Pegasus/AF Small Launch Vehicle (AFSLV) at Vandenberg AFB, California, and the MLV III. Major efforts include: Delta II range safety upgrades, new composite solid rocket motor cases, procurement and launch of 28 Global Positioning System (GPS) and 2 NASA satellites; Atlas II site activation, payload integration, procurement, and launch of 11 Defense Satellite Communication System (DSCS) and 2 Space Test Program (STP) satellites; modification and launch of 14 Titan IIs; development, procurement and launch of 2 Pegasus and 16 AFSLVs; and MLV III site activation, payload integration, procurement, and launch of 20 GPS IIR satellites. This program also provides systems engineering and management support. ELV performance is as follows:

| BOOSTER | MISSION ORBIT | CAPABILITY (lb to orbit) |
|---|---|---|
| Atlas II | From CCAFS, i=26.5 deg., 90 X 19,323 nmi | 6,100 |
| Delta II | From CCAFS, i=28.7 deg., 100 X 19,323 nmi | 4,010 |
| Titan II | Low Polar | 4,200 |
| Atlas E | Low Polar | 1,750 |
| Pegasus/AFSLV | From Aircraft, i=90 deg., 400 nmi circular | 459 |

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Launched two Atlas E boosters to support the Defense Meteorological Satellite Program (DMSP) and the National Oceanic Atmospheric Administration (NOAA)
   - (U) Awarded the Delta II Follow-on contract (8 vehicle b[illegible] in Aug 91
   - (U) Continued activation of Atlas II launch complex (LC-36) at Cape Canaveral AFS
   - (U) First Atlas II "booster on stand"
   - (U) Launched three GPS satellites on Delta II
   - (U) Awarded AFSLV contract on 4 Jun 91; procured first AFSLV

2. (U) FY 1992 Planned Program:
   - (U) Continue Titan II refurbishment
   - (U) Continue Delta II procurement and safety upgrades
   - (U) Attain Atlas II Initial Launch Capability (ILC) and first launch from SLC-36A
   - (U) Launch two Titan IIs, five Delta IIs (including NASA EUVE satellite), two Atlas Es, and three Atlas IIs
   - (U) Launch first Air Force-sponsored Pegasus and procure one AFSLV
   - (U) Transfer Atlas E launch services contract to AFSPACECOM
   - (U) Award Medium Launch Vehicle III (MLV III) contract

Program Element: #0305119F
PE Title: Medium Launch Vehicles
(formerly Space Boosters)

Project: # N/A
Budget Activity: #6 - Defense Wide Mission Support

3. (U) FY 1993 Planned Program:
   - (U) Launch two Atlas II and seven Delta II boosters
   - (U) Launch second Air Force-sponsored Pegasus, and procure two AFSLVs
   - (U) Provide Atlas E systems engineering support
   - (U) Continue Delta II procurement and safety upgrades
   - (U) Continue Atlas II procurement
   - (U) Continue MLV III site activation, payload integration, and initiate advance procurement

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

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 is McDonnell Douglas Space Systems Corporation, Huntington Beach, CA. Atlas II and Atlas E prime contractor is General Dynamics, Space Systems Division, San Diego, CA. Titan II prime contractor is Martin Marietta Corporation, Denver, CO. Pegasus/AFSLV contractor is Orbital Sciences Corporation, Fairfax, VA. MLV III contractor will be determined by full and open competition with contract award planned for 1992.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: none
2. (U) SCHEDULE CHANGES: Atlas II ILC and first two launches slip from FY91 to FY92. GPS spacecraft problems result in rephasing of Delta II launch schedule (two launches slip from FY 91 to FY92). First and second AF-sponsored Pegasus launches slip one year to FY92 and FY 93, respectively.
3. (U) COST CHANGES: none

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) National Oceanic and Atmospheric Administration polar meteorological and earth resources satellites*
   - (U) LANDSAT and TIROS Programs, NASA*
   - (U) Pegasus and Taurus Programs, DARPA*
   - (U) Brilliant Pebbles (Pre-FSD payload), Stategic Defense Initiative Organization*
   - (U) There is no unnecessary duplication of this effort within the Air Force or the Department of Defense.

* Note: Asterisks indicate related 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):

Program Element: #0305119F
PE Title: Medium Launch Vehicles
(formerly Space Boosters)

Project: # N/A
Budget Activity: #6 - Defense Wide Mission Support

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost* | 269,731 | 221,304 | 226,637 | Cont | TBD |
| Units* | 5 | 4 | 4 | Cont | TBD |

* Does not reflect Titan II or Titan IV funding/quantities.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. (U) | Atlas II first AF launch | February 1992 |
| 2. (U) | MLV III contract award | September 1992 |
| 3. (U) | AFSLV first launch | 1st Qtr FY 1993 |
| 4. (U) | MLV III first launch | 1st Qtr FY 1996 |

FY 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| CSOC | 21,790 | 15,045 | 0* | 0 | 460,291 |

* Funds moved to PE 35110F

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 Mission Control Centers (MCCs). The CS provides intrastation communications and connectivity to the existing AFSCN. The NCS schedules and controls the RTS.

C. (U) *PROGRAM ACCOMPLISHMENTS AND PLANS:*

(U) FY 1991 Accomplishments:
- (U) Operational turnover of Weather Support Unit to AFSPACECOM
- (U) Completed 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) Turned over operations in MCC-2 (COMSATs) to AFSPACECOM.
- (U) Continued development and integration of the CS.

(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) Wideband Data Connectivity (WDC) completed.

(U) FY 1993 Planned Program:
- (U) Refer to Air Force Satellite Control Network (AFSCN) PE 35110F

(U) Program To Completion: Not Applicable (RDT&E complete in FY 1993).

Program Element: #0305130F Project Number: XXX1
Title: Consolidated Space Operations Center Budget Activity: #6-Defense Wide Mission Support

D. (U) WORK PERFORMED BY: Program is managed 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 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: None
3. (U) COST CHANGES: None. $5.9M FY 93 RDT&E funds were moved to PE 35110F

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 |
| - (U) CSOC Program Management Directive 0042(14) | Nov 1991 |

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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 6,456 | 16,176 | 11,547 | Cont | TBD |

(U) Military Construction: None

I. (U) INTERNATIONAL AGREEMENTS: Not Applicable

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. (U) | Mission Control Center 1B (MCC-1B) IOC | 3Q FY 1992 |
| 2. (U) | Satellite Operations Complex (SOC) and NCS Turnover | 4Q FY 1992 |
| 3. (U) | Communications Segment Turnover and Full CSOC Turnover | 3Q FY 1993 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305137F Project: # None
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 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| Major Contract | Dem/Val Contracts MAMS 2,200 | MAMS 1,000 | MAMS 3,200 Full Scale Devel Contract | TBD |
| Support Contract | MITRE 1,500 MM * 900 | MITRE 1,000 MM * 268 | MITRE 2,000 MM * 900 | TBD |
| In-House Support | Logistics, Travel, SPO 1,600 | Logistics, Travel, SPO 200 | Logistics Travel, SPO 1,000 | TBD |
| GFE/ Other | NAS Integration 3,698 | NAS Integration 530 | | TBD |
| Total | 9,898 | 2,998 | 7,100 | TBD |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | To Complete |
| Program Milestones | MS 0-Nov 90 | MS I-Jun 92 | | MS II - FY 94 IOC - FY 98 FOC - FY 2003 |
| Engineering Milestones | MAMS Prototype | MAMS Prototype Complete | | |
| T&E Milestones | | | | Start Facility Testing FY 95 |
| Contract Milestones | MAMS Prototype | | MAMS Full Scale Development | Start Systems Acquisitions FY 96 |

* Martin-Marietta technical engineering management support.

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 may 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, provides 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 provide continued quantity and quality of ATC services to the aviation community. MAMS will effective schedule and manage special use airspace. DOD military ATC and fighting/flying readiness will be maintained.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Continued DOD NAS Implementation Plan development.
   - (U) Prototype Military Airspace Management System (MAMS).
   - (U) Conducted facility site surveys, environmental assessments.
   - (U) Developed Tower/Remote-Tower RAPCON (T/RT) specification for DOD facilities, part of the Advanced Automation System.
   - (U) Developed interfacility architecture.
   - (U) Continued cost trade off studies and analyses.
   - (U) Completed Cost and Operational Effectiveness Analysis to determine the best technical and most cost effective program.
   - (U) Developed radar and beacon systems specification.
   - (U) Defined Voice Communications and Switching System (VCSS).

2. (U) FY 1992 Planned Program:
   - (U) Complete 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.
   - (U) Complete cost trade off studies and analyses for the June 92 Milestone I Defense Acquisition Board.

3. (U) FY 1993 Planned Program:
   - (U) Award MAMS Engineering & Manufacturing Development (EMD) contract. Effort includes development of 100,000 lines of software code and a large data base supporting management of military special use airspace nationwide.
   - (U) Continue site surveys, facility planning, transition planning.
   - (U) Update of the Cost and Operational Effectiveness Analysis to support Milestone II decision.
   - (U) Develop NAS Integration Plan.
   - (U) Evaluate Secondary Surveillance Radar requirements.

Program Element: #0305137F Budget Activity: #4 - Tactical Programs
PE Title: National Airspace System (NAS)

4. (U) Program to Completion:
   - (U) Installation and testing of NAS equipment in prototype air traffic control facilities (Control Towers, Military Terminal Radar Approach Controls (MTRACON), and Consolidated Radar Approach Controls (CRF)) in FY 94-96.
   - (U) Acquisition and installation, if appropriate, of the Advanced Automation System, Voice Communications Switching System, Mode S, Digital Airport Surveillance Radar, and other systems in FY 97-2002.
   - (U) DOD ATC facilities modifications/construction starting in FY 96.
   - (U) IOC FY 98.
   - (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 1992 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: NAS Milestone I deferred to better define system requirements. NAS Milestone II and system acquisition schedules were adjusted outward to reflect a more realistic acquisition program.
3. (U) COST CHANGES: FY 91 funds reduced for Air Force higher priority programs. FY 92 funds reduced by Congress, and adjusted by reduced funding for Federally Funded Research and Development Centers (FFRDC). Also, FY 93 was adjusted by reduced funding for FFRDC. Refined program cost estimates and program delays (including Milestone II) resulted in reduced NAS program costs in FY 91 and FY 92 and shifted Engineering Manufacturing Development costs to FY 94 and out.

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 Capital Investment Plan, Dec 90.
   - (U) Operational Requirements Document 001-85-I, Military Airspace Management System (MAMS), 12 Dec 91.
   - (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

Program Element: #0305137F Budget Activity: #4 - Tactical Programs
PE Title: National Airspace System (NAS)

G. (U) RELATED ACTIVITIES:
- (U) NAS is 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.
- (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.
- (U) Joint Potential Designator to be determined at Milestone I.

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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 0001 Upper Stages Development (Inertial Upper Stage) | 4,129* | 5,775 | 3,848 | Cont | TBD |
| XXX2 Space Nuclear Thermal Propulsion (SNTP) Program | 0 | 43,553** | 38,852 | Cont | TBD |
| Total | 0 | 49,328 | 42,700 | Cont | TBD |

* An element of PE 0305171F through FY 1991.
** Air Force program initiated in FY 1992 in PE 0603105F.

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 Upper Stages effort is in support of the Inertial Upper Stage (IUS). The effort includes flight operations at the Eastern Launch Site (ELS), FL and support to flight operations at the Consolidated Space Test Center (CSTC), and reimbursable acquisition and operations support of upper stages for NASA as documented in MOA/MOUs between USAF and NASA. We also do centralized management for the definition of changes to the NASA Cargo Transfer Vehicle based on validated DoD user requirements. Lastly, the program continuously evaluates and improves upper stage reliability, cost effectiveness, and responsiveness.
The Space Nuclear Thermal Propulsion Program provides the technology base for exoatmospheric applications (upper stages and transfer vehicles). The program goal is to develop a lightweight 75,000 pound thrust propulsion system at 1000 ISP. The program is structured so that at the end of each phase, testing will determine if it is appropriate to continue. If prototyping is successful, the program will hold after ground test and a determination of potential applications will be made.

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

1. (U) Project 0001, Upper Stage Development (Inertial Upper Stage): 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 1991 Accomplishments:
- (U) Provided quick response studies/analyses in support of two DoD missions.
- (U) Provided independent verification and validation of IUS flight software for two IUS missions

(U) FY 1992 Planned Program:
- (U) Provide studies/analyses in support of at least one DoD mission.
- (U) Provide technical analyses concurrent with the long lead for two IUSs (production restart).
- (U) Provide technology assessment studies of future upper stage requirements.

(U) FY 1993 Planned Program:
- (U) Provide studies/analyses in support of at least one DoD mission.
- (U) Provide technology assessment studies of future upper stage requirements.

(U) Work Performed By: The responsible Air Force agency is Air Force Systems Command's Space Systems

Program Element: #0305138F
PE Title: Upper Stages

Budget Activity: #6 - Defense Wide Mission Support

Division, Los Angeles AFB, CA. Systems engineering is provided by the Aerospace Corporation, El Segundo, CA. The prime contractor for IUS, associated integration, engineering support and launch support is Boeing Aerospace and Electronics Company, Seattle, WA. Independent verification of flight software is performed by Martin Marietta Corporation, 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) PE 0305171F, Space Shuttle Operations
- (U) PE 0603105F, Olympic
- (U) Various NASA scientific and communications satellites
- (U) There is no unnecessary duplication of effort within the Air Force, Department of Defense, or National Aeronautics and Space Administration

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

(U) Missile Procurement (BA 5):

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| (Cost) | 23,128* | 61,323 | 88,300 | Cont | TBD |

*$15.1M was an element of PE 0305171F in FY 1991.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305138F
PE Title: Upper Stages Program
Project Number: XXX2
Budget Activity: #6 - Defense Wide Mission Support

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

| Project Title / Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Space Nuclear Thermal Propulsion (SNTP) Program | 0 | 43,553** | 38,852 | Cont | TBD |

** Air Force program initiated in FY 1992 in PE 0603105F.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The objective of this program is to provide the technology base, design, develop, integrate, and validate, via ground test, a prototype nuclear rocket engine for a variety of exoatmospheric applications. The engine is designed around a particle bed reactor which is gas cooled using liquid hydrogen. The goal of this engine is 75,000 pounds of thrust at 1000 ISP. The ground test article is being designed as an upper stage. Additionally, the engine could be used for cargo transfer vehicles and space exploration applications. The program is structured so that a series of tests along the way determine if the program will continue. Currently, the Air Force plans to give greater roles to the Department of Energy and the National Aeronautics and Space Administration due to the variety of applications and technology spin-offs that are already underway.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Successful development of fuel kernals with sealings that withstood temperatures in excess of 3000K
   - (U) Completed fabrication and tested a low pwoer particle bed reactor (PBR) critical experiment (CX)

2. (U) FY 1992 Planned Program:
   - (U) Particle Bed Reactor Integral Performance Element Tester (PIPET) Preliminary Design Review (PDR)
   - (U) PIPET elements fabrication
   - (U) Continue Nuclear Element Tests (NET)
   - (U) Continue advanced fuel fabrication
   - (U) Complete preliminary safety analysis report
   - (U) Continue materials testing
   - (U) Prepare for the engine concept design review

3. (U) FY 1993 Planned Program:
   - (U) Continue work on advanced fuel
   - (U) Continue Nuclear Element Tests (NET)
   - (U) Continue work on system technologies required for full scale testing of ground test article
   - (U) Continue preparation work for infrastructure projects, such as environmental impact analyses, preliminary equipment designs, etc., which will begin in fiscal year 1994

4. (U) Program to Completion
   - (U) Complete testing of the ground test article
   - (U) Review program after successful completion to determine applications

D. (U) Work Performed By: The responsible Air Force agency is Air Force Systems Command's Space Systems Division's Phillips Laboratory, Albuquerque, NM. The program office is currently managed by DoD, but will soon be a joint DoD/DOE/NASA program office (JPO), headed by an Air Force program director with DOE

Program Element: #0305138F
PE Title: Upper Stages Program

Project: Number: XXX2
Budget Activity: #6 - Defense Wide Mission Support

and NASA deputies. Systems engineering is provided by Xerad, Santa Monica, CA. System integration is Grumman Space Systems Division, Bethpage, NY. Other efforts are contracted with: Garrett Fluid Systems Division (Allied Signal), Tempe, AZ; Hercules Aerospace Company, Magna, UT; Babcock & Wilcox, Lynchburg, VA; Aerojet TechSystems Company, Sacramento, CA; United Nuclear Corporation, Bridgeport, CT; General Dynamics Space Systems, San Diego, CA.

E. (U) COMPARISON WITH FY 1992 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) AFSPACECOM SORD 005-88-1 for a Military ALS, dated 14 August 1990
- (U) AFSPACECOM SON 005-88 for an Advanced Launch System, dated 12 August 1988

G. (U) RELATED ACTIVITIES:
- (U) PE 0603105F in fiscal year 1992.

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

(U) Military Construction (In FY94 only)

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 0 | 0 | 82,000 | 82,000 |

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

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. (U) | Space Nuclear Thermal Propulsion Program initiated | 1991 |
| 2. (U) | Completion of Nuclear Element Tests | 1995 |
| 3. (U) | Full Scale Facility Construction Complete | 1997 |
| 4. (U) | NLS Critical Design Review | 1997 |
| 5. (U) | Subscale Reactor Tests Complete | 1998 |
| 6. (U) | Full Scale Reactor Tests Complete | 2000 |
| 7. (U) | Rocket Engine Ground Testing Complete | 2001 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305144F
PE Title: Titan IV Acquisition

Project Number: 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 1991 | FY 1992 | FY 1993 | TO COMPLETE |
|---|---|---|---|---|
| Major Contract | 149,177 | 131,045 | 132,655 | Continuing |
| Support Contract | 4,050 | 1,372 | 4,139 | Continuing |
| In-House Contract | 9,209 | 9,115 | 9,106 | Continuing |
| GFE/Other | | | | |
| TOTAL | 162,436* | 141,532 | 142,800 | Continuing |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | TO COMPLETE |
| Program Milestones | First West Coast Launch | Solid Rocket Motor Assembly Facility IOC | SRMU Initial Launch Capability (ILC) | Centaur Processing Facility (CPF) IOC FY 1995 |
| Engineering Milestones | TIV/NUS ILC VAFB | First TIV Centaur Flight | First Flight New Avionics | First SRMU Flight (FY94) |
| T & E Milestones | SRMU Pre-Qualification Test (Case Burst) | SRMU Pre-Qualification Retest | Complete SRMU Test Program | |
| Contract Milestones | Program Stretchout | | New Contract (vehicle 42+) | |

* Program funded in PE 0305119F prior to FY92

Program Element: #0305144F
PE Title: Titan IV Acquisition

Project Number: NA
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 launch facilities. This program is developing several different configurations for the Titan IV (no upper stage, Inertial Upper Stage, and Centaur). In addition, the Titan IV program is developing an upgraded solid rocket motor and new programmable avionics and ground support equipment to meet reliability and increased performance requirements. This program provides continuing integration support to the payload community as well as continuing engineering support and post-flight analyses to enhance system characterization and reliability. Titan IV performance, by configuration is summarized below:

| CONFIGURATION | MISSION ORBIT | PERFORMANCE (lbs to orbit) |
|---|---|---|
| Titan IV/Centaur/SRM | Geosynchronous | 10,000 |
| Titan IV/Centaur/SRMU | Geosynchronous | 11,500 |
| Titan IV/IUS | Geosynchronous | 5,200 |
| Titan IV/NUS/SRM | Low Earth (Polar) | 31,100 |
| Titan IV/NUS/SRMU | Low Earth (East) | 47,800 |

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Delivered first Centaur
   - (U) Launched first Titan IV from Vandenberg AFB
   - (U) Began Solid Rocket Motor Upgrade (SRMU) qualification firing program
   - (U) Completed modifications to LC-41
   - (U) Continued modifications to LC-40
   - (U) Continued payload integration activities for MILSTAR and DSP

2. (U) FY 1992 Planned Program:
   - (U) Continue SRMU qualification program (PQM-1' firing)
   - (U) Achieve TIV/IUS/NUS ILC at LC-40 (Jul 92)
   - (U) Continue Programmable Aerospace Ground Equipment (PAGE) development
   - (U) Begin Centaur Processing Facility construction at CCAFS
   - (U) Complete construction of Solid Motor Assembly Facility (SMARF)
   - (U) Launch first Titan IV/Centaur
   - (U) Continue integration activity for MILSTAR and DSP
   - (U) Support contractor funding reduced as a result of FFRDC cut in FY92

3. (U) FY 1993 Planned Program:
   - (U) Achieve Titan IV/Centaur ILC at LC-40
   - (U) Complete SRMU qualification firing program
   - (U) Award contract for next increment of Titan IV launch vehicles (42 +)
   - (U) Achieve SRMU ILC
   - (U) Continue construction of CPF and design of CPF AGE
   - (U) Continue integration for DSP and MILSTAR

4. (U) Program to Completion:
   - (U) This is a continuing program
   - (U) Achieve CPF IOC (FY 95)
   - (U) Continue flight assessment, reliability enhancement, and obsolete part replacement until all vehicles are flown

Program Element: #0305144F
PE Title: Titan IV Acquisition

Project Number: NA
Budget Activity: #6 - Defense Wide Mission Support

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 is Martin Marietta Corp, Denver, CO.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES:
   The first SRMU test firing resulted in a burst case due to design problems. As a result the SRMU program has been restructured and ILC has slipped from Jun 92 to Aug 93. The Titan IV/Centaur ILC has slipped to Mar 92 as a result of problems detected in a commercial Centaur launch (Baseline schedule breach).
3. (U) COST CHANGES:
   Production of Titan IV vehicles has been slowed down due to decreased launch requirements. Cost impact is approximately $40 Million for RDT&E in FY93-FY95. FY91 funding increased $20 million due to reprogramming to repair test facility damaged during SRMU test in Apr 91.

F. (U) PROGRAM DOCUMENTATION:
- (U) National Space Policy, Jan 1988
- (U) Program Decision Memorandum, 25 Jul 1988
- (U) Titan IV SORD, 2 Apr 1991

G. (U) RELATED ACTIVITIES:
- (U) Classified Space Programs (funds classified user launch vehicles and VAFB launch services)
- (U) PE 0102431F Defense Support Program
- (U) PE 0303603F Milstar
- (U) PE 0305119F Medium Launch Vehicles
- (U) PE 0708022F SAMTO Test Ranges (ESMC)
- (U) PE 0708032F SAMTO Test Ranges (WSMC)
- (U) There is no unnecessary duplication of effort within the Air Force or DoD

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

(U) Missile Procurement (BA 5)

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 202,312* | 287,531 | 345,848 | Continuing | Continuing |

(U) Other Procurement (BA 83)

| | | | | | |
|---|---|---|---|---|---|
| Cost | 0 | 0 | 0 | 234 | 45,847 |

* Funding for Titan IV prior to FY92 and all MILCON contained in PE 0305119F

Program Element: #0305144F
PE Title: Titan IV Acquisition

Project Number: NA
Budget Activity: #6 - Defense Wide Mission Support

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| (U) Military Construction | | | | | |
| Cost | 10,000 * | 24,000 * | 33,000 * | 0 | 120,000 |
| Quantity | 2 | 0 | 0 | Continuing | 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 requirement |
| SRMU PQM-1 firing | 1 Apr 91 | Case burst when pressure limit exceeded<br>Retest required |

T & E ACTIVITY (TO COMPLETION)

| Event | Planned Date | Remarks |
|---|---|---|
| PQM-1' (retest) | May 92 | Satisfies remaining PQM objectives<br>If successful, cast QM-1 |
| Qual motor QM-1 | Jun 92 | If successful, cast QM-3 |
| QM-2 | Aug 92 | |
| QM-3 | Dec 92 | If successful, cast first flight set |
| QM-4 | Mar 93 | Conduct flight readiness review following test |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element:: #0305145F Budget Activity: #3 - Nuclear Deterrence
PE Title: Arms Control

A. (U) Resources ($ in Thousands)

| Project Number & Title | FY1991 Actual | FY1992 Estimate | FY1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 4189 Minuteman III (MMIII) De-MIRVing Preparation | 0 | 9000 | 3950 | 0 | 12950 |
| 4190 Treaty Prep/verification support | 0 | 5694 | 562 | TBD | TBD |
| Total | 0 | 14694 | 4512 | TBD | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program directly supports implementation and planning for current and pending arms control agreements. Preparation includes MMIII de-MIRVing actions necessary to meet constrained reentry vehicle (RV) limitations under the Strategic Arms Reduction Talks (START) Treaty. Treaty preparation/verification support activities encompasses a wide range of projects required to prepare the United States for impending treaty implementation.

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

1. (U) Project 4189, MMIII De-MIRVing: The objective of this project is to comply with START Treaty requirements that call for a new RV platform when downloading the MMIII to a single RV configuration. This project includes the research and development costs associated with the new bulkhead design, testing, limited production, and all software modifications necessary to permit MMIII flight in the single RV configuration.

(U) FY 1991 Accomplishment:
- (U) None, This is a new program.

(U) FY 1992 Planned Program:
- (U) RV platform design.
- (U) Fabricate test platforms.
- (U) Modify existing MMIII software to permit launch in single RV configuration.
- (U) Complete RV platform design.
- (U) Prepare for platform production.

Program Element: #0305145F Budget Activity: #3 - Nuclear Deterrence
PE Title: Arms Control

- (U) Complete and test MMIII software modifications that enable successful flight in single RV configuration.

(U) FY 1993Planned Program:

(U) Work Performed By:
- (U) TBD

(U) Related Activities:
- (U) PE 0101213 Minuteman Squadrons
- (U) There is no unnecessary duplication of effort within the Air Force of the Department of Defense.

(U) Other Appropriation funds ($ in Thousands):
- (U) Missile Procurement (3020) Funds

| | FY1991 Actual | FY1992 Estimate | FY1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 1000 | 21300 | 3100 | 25400 |

(U) International Cooperative Agreements:
- (U) None.

2. (U) Project 4190, Treaty Prep/Verification Support: This project supports costs directly associated with preparing for implementation of arms control treaties and agreements. It includes preparation for the START required continuous monitoring activities at Thiokol's Strategic Operations Facility, telemetry data support, program management costs, and pre-inspection activities required to support immediate compliance with pending treaties/agreements.

(U) FY 1991 Accomplishment
- (U) None

(U) FY 1992 Planned Program:
- (U) Provide support for monitoring activity preparation at Thiokol's Strategic Operations Facility.
- (U) Support ongoing telemetry negotiations, data interpretation, and troubleshooting.
- (U) Maintain program management, including contractor support, Air Staff travel, and MAJCOM oversight.

Program Element: #0305145F Budget Activity: #3 - Nuclear Deterrence
PE Title: Arms Control

- (U) Prepare required site diagrams for additional inspectable facilities.

(U) FY 1993Planned Program:
- (U) Maintain program management, to including contractor support, Air Staff travel, and MAJCOM oversight.
- (U) Support of telemetry interpretation/troubleshooting.
- (U) Support implementation/follow on development of the START Tracking and Reporting System

(U) Work Performed By:
- (U) TBD

(U) Related Activities:
- (U) None

(U) Other Appropriation funds ($ in Thousands):
- (U) Operations and Maintenance (3400) funds.

| | FY1991 Actual | FY1992 Estimate | FY1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 16.7 | TBD | TBD | TBD |

(U) International Cooperative Agreements:
- (U) None.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 0001 CONSTANT SOURCE | 7514 | 11886* | 7500* | Cont | TBD |
| Total | 7514 | 11886 | 7500 | Cont | TBD |

* : 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 leverages national and tactical capabilities to deliver near-real-time threat information directly to combat units 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 FY 1993:

1. (U) Project 0001, CONSTANT SOURCE: Efforts include software engineering and development of a miniaturized airborne qualified multi-channel, multi-source capability (i.e., receive and correlate inputs from national and tactical sources simultaneously) for airborne and ground deployment.

(U) FY 1991 Accomplishments:
- (U) Supported Desert Storm operations.
- (U) Continued development of the airborne qualified system.
- (U) Planned for upgrading ground systems to a multi-channel capability (i.e., TRAP, TADIXS, and TIBS).
- (U) Placed correlation software under configuration control.
- (U) Acquired tech data to support logistics planning.
- (U) Initiated planning for a FY93 production contract award.

(U) FY 1992 Planned Program:
- (U) Continue FSD of the airborne system.
- (U) Plan for SOF aircraft integration.
- (U) Conduct DT&E and prepare for IOT&E.
- (U) Continue planning for a FY93 production contract award.
- (U) Commence upgrade of ground systems to a multi-channel capability.
  -- (U) Desert Storm supplemental of $3.7M to accelerate this effort.
- (U) Update software and execute ECPs as required.

(U) FY 1993 Planned Program:
- (U) Complete FSD of the airborne system.
- (U) Conduct IOT&E.
- (U) Update software and execute ECPs as required.
- (U) Award a competitive production contract.

Program Element: # 0305158F Budget Activity: #4 - Tactical Programs
PE Title: CONSTANT SOURCE

(U) Work Performed By: 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).Top five contractors include Assurance Technology Corp., Carlisle, Massachusetts; BTG, Inc., Vienna, Virginia; Mnemonics, Inc., Melbourne, Florida; Harris Corp., Melbourne, Florida; Lockheed Sanders, Hudson, NH.

(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 #0305158F, BA #4):

| | FY 1991 Actual | FY 1992 Estimate | FY1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 1935 | 23092 | 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 1993 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 1991 | FY 1992 | FY 1993 | Program Total (To Complete) |
|---|---|---|---|---|
| Major Contract | 39,363 | 19,263 | 15,037 | Continuing |
| Support Contract | 7,282 | 7,179 | 6,705 | Continuing |
| In-House Support | 1,483 | 1,511 | 1,408 | Continuing |
| GFE/ Other | 280 | 281 | 150 | Continuing |
| Total | 48,408 | 28,234 | 23,300 | Continuing |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | TO COMPLETE |
| Program Milestones | F-10 Launch | F-11 Launch | Milestone IV, 3Qtr | |
| Engineering Milestones | Begin Blk 6 Risk Reduction | | Mark IVB IOC | Begin Block 6 System Qual 1Qtr FY1997 |
| T&E Milestones | | Mark IVB OT&E Mar 92 | | |
| Contract Milestone | | Begin Mark IVB Prdctn 3Qtr 92 | | Final Mark IVB Delivery 1Qtr FY 1997 |

Program Element: #0305160F
PE Title: Defense Meteorological Satellite Program (DMSP)
Project: #XXX1
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 meteorological satellite 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 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 1993, then transition to Titan II.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Began Block 5D-3 launch facility upgrades.
   - (U) Continued system integration and test and sensor development, calibration and validation and related support activities.
   - (U) Awarded two parallel competitive Block 6 advanced development contracts for technology risk reduction.
   - (U) Launched satellite F-10

2. (U) FY 1992 Planned Program:
   - (U) Deliver the first Block 5D-3 satellite (S-15).
   - (U) Finish Block 5D-3 launch facility upgrades.
   - (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 development.
   - (U) Complete Mark IVB IOT&E and begin Mark IVB production.
   - (U) Continue Block 6 advance development contracts for technology risk reduction.
   - (U) Launch satellite F-11

3. (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 advanced development contracts for technology risk reduction.
   - (U) Transition to Titan II launch vehicle.

4. (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.

Program Element: #0305160F Project: #XXX1
PE Title: Defense Meteorological Satellite Program (DMSP) Budget Activity: 6-Defense Wide Mission Support

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 1992 DESCRIPTIVE SUMMARY:

Narrative Description of Changes

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: Slip in Mark IVB IOT&E and production decision from Oct 1991 to March 1992 due to software development problems.

3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

(U) Joint-Service MOA (USAF/USN/USA/DOD), 15 Dec 76
(U) AF SON 508-78, 28 Dec 78
(U) AF SON 01-83, 17 Mar 83
(U) JCS Requirements Memorandum 154-86, 1 Aug 86
(U) AF SON 02-80, 14 Feb 86
(U) TEMP, 22 Jan 88
(U) AF 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 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, includes leased communications.
(U) Navy and Army jointly fund 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 147,719 | 106,115 | 31,425 | Cont. | TBD |
| Quantity | 1 | 2 | 0 | | |

Program Element: #0305160F Project: #XXX1
PE Title: Defense Meteorological Satellite Program (DMSP) Budget Activity: 6-Defense Wide Mission Support

(U) Other Procurement (BA 83) (includes spares):

| | | | | | |
|---|---|---|---|---|---|
| Cost | 19,874 | 15,434 | 20,398 | 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 |
|---|---|---|
| Fairchild SOC OT&E | May 89 | Fully Operational |
| F-10 On-Orbit Checkout and Turnover to AFSPACECOM | Jan 91 | Fully Operational |
| F-11 On-Orbit Checkout and Turnover to AFSPACECOM | Dec 91 | Fully Operational |

T&E ACTIVITY (TO COMPLETION)

| Event | Planned Date | Remarks |
|---|---|---|
| Mark IVB OT&E | Mar 92 | On Schedule |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305164F
PE Title: Navstar Global Positioning System (GPS) User Equipment

Project Number: NA
Budget Activity: #5 - Intelligence and Communications

Project Title: GPS

Popular Name: GPS

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

| BUDGET ($ 000) | FY 1991 | FY 1992 | FY 1993 | TO COMPLETE |
|---|---|---|---|---|
| Major Contract | 8,320 | 10,125 | 17,200 | Continuing |
| Support Contract | 3,138 | 3,164 | 3,200 | Continuing |
| In-House Support | 855 | 855 | 900 | Continuing |
| GFE/Other | 300 | 300 | 400 | Continuing |
| TOTAL | 12,613 | 14,444 | 21,700 | N/A |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | TO COMPLETE |
| Program Milestones | N/A | Milestone III Jan 92 User Equipment | N/A | Production Continues thru 1990's |
| Engineering Milestones | N/A | N/A | N/A | N/A |
| T & E Milestones | Additional UE OT&E 12/90-7/91 | MAGR QOT&E 4/92 - 12/92 | PLGR QOT&E 8/93 - 11/93 | N/A |
| Contract Milestones | LRIP option award Mar 91 | Full rate prod opt 2Q 92 | Full rate prod opt 2Q 93 | Full rate prod options continue |

Program Element: #0305164 Project Number: NA
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 1991 Accomplishments:
   - (U) Continued previously initiated integration activities (A-10, C-5, C-9, C-141).
   - (U) Continued development of mission planning system.
   - (U) Continued development of Integrated Support Facility.
   - (U) Awarded Miniaturized Airborne GPS Receiver (MAGR) contract.
   - (U) Continued Independent Verification and Validation (IV and V) of platform integration and of GPS receiver software.

2. (U) FY 1992 Planned Program:
   - (U) Continue development of Integrated Support Facility.
   - (U) Deliver and test MAGR engineering development hardware.
   - (U) Continue IV and V.

3. (U) FY 1993 Planned Program:
   - (U) Support developmental testing of aircraft integrations.
   - (U) Complete development of software Integrated Support Facility.
   - (U) Continue IV and V.
   - (U) Continue testing MAGR development items.
   - (U) Conduct product improvement studies (embedded GPS, space-based receivers, anti-jam, and differential GPS).

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

Program Element: #0305164F
PE Title: Navstar Global Positioning System (GPS) User Equipment

Project Number: NA
Budget Activity: 5 - Intelligence and Communications

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 1992 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, January 1992
- (U) Integrated Program Assessment, January 1992
- (U) Integrated Program Summary, December 1991
- (U) Integrated Multi-Service Test and Evaluation Master Plan, October 1991
- (U) System Operational Requirements Document, January 1990
- (U) Navstar GPS Baseline, 22 December 1989

G. (U) RELATED ACTIVITIES:

- (U) GPS development and operational implementation are joint activities. Air Force is Executive Agent. Air Force develops, procures, and operates space and control segments. Services jointly develop and procure user equipment through the Joint Program Office.
- (U) Other agencies are the Army, Navy, Marine Corps, Defense Mapping Agency, Department of Transportation, North Atlantic Treaty Organization and Australia
- (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) PE 0301357F and 0305913F (formerly 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
- (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) There is no unnecessary duplication of effort within the Air Force or DoD

Program Element: #0305164F
PE Title: Navstar Global Positioning System (GPS) User Equipment

Project Number: NA
Budget Activity: 5 - Intelligence and Communications

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

(U) Aircraft Procurement (BP 11, 12, 16, 19)

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Funds | 35,002 | 106,253 | 165,896 | Continuing | Continuing |
| Quant. (Receivers) | (78) | (59)* | (140)* | | |

(U) Other Procurement

| | | | | | |
|---|---|---|---|---|---|
| Funds | 1,635 | 4,920 | 11,687 | Continuing | Continuing |
| Quant. (Manpacks) | (0) | (0) | (571) | | |

* FY 93 ABES

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: In Apri, 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. A new MOU was signed to cover 1992 - 1993. Portugal and Turkey have been added, increasing member nations to 12. 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 5 channel sets. |
| | Dec 90-Jul 91 | Additional Air Force, Army and Navy OT accomplished. All equipment exceeded MTBOMF requirements. |

T&E ACTIVITY (TO COMPLETION)

| Event | Planned Date | Remarks |
|---|---|---|
| OT&E | MAGR OT is scheduled for Apr-Dec 92<br>PLGR OT is scheduled for Aug-Nov 93 | |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305165F
PE Title: Navstar Global Positioning System (GPS) Space/Control

Project Number: NA
Budget Activity: #5 - Intelligence and Communications

Project Title: GPS

Popular Name: GPS

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

| BUDGET ($ 000) | FY 1991 | FY 1992 | FY 1993 | TO COMPLETE |
|---|---|---|---|---|
| Major Contract | 39,693 | 45,165 | 54,122 | Continuing |
| Support Contract | 2,543 | 1,987 | 1,831 | Continuing |
| In-House Support | 2,593 | 2,771 | 2,784 | Continuing |
| GFE/Other | 2,104 | 1,322 | 1,108 | Continuing |
| TOTAL | 46,933 | 53,127 | 59,845 | N/A |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | TO COMPLETE |
| Program Milestones | N/A | N/A | 3-D Coverage 2Q-FY 93 | N/A |
| Engineering Milestones | Control Software CDR | N/A | N/A | N/A |
| T & E Milestones | Cntrl Seg Phase II IOT&E 5/91-7/91 | N/A | Cntrl Seg Phase III IOT&E | N/A |
| Contract Milestones | IIR Long Lead Cont Award Oct 90 | 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: NA
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, and operation of the ground control segment; upgrades to 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 worldwide passive, all-weather, and all-altitude precise 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 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 1991 Accomplishments:
   - (U) Operational satellite launches/on-orbit support continued.
   - (U) Completed replenishment satellite design; began piece part qualification and development of test hardware. Procurement of replenishment satellites began.
   - (U) Started upgrade to ground control software to support Block IIR satellites.
   - (U) Completed Block IIR space vehicle CDR.
   - (U) Control segment support operations to on-orbit constellation and launch and early orbit (LEO) operations continued.
   - (U) Completed three major design reviews (PDR, SDR, and CDR) for major ground control software packages which supported residual tasks from the Oct 87 PMRT and the Apr 90 system turnover agreements.
   - (U) Modified residual development contract to include control segment Interim Back-up Master Control Station (IBUMCS) capabilities at the IBM facility in Gaithersburg, MD.
   - (U) Continued upgrade of control segment required by PMRT and system turnover agreements.
   - (U) Control segment support operations to the on-orbit constellation and LEO operations continued.

2. (U) FY 1992 Planned Program:
   - (U) Operational satellite launches/on-orbit support will continue.
   - (U) Complete qualification testing of first Block IIR satellite.
   - (U) Complete SDR for upgrade to ground control software (approximately 200,000 lines of code) to support Block IIR satellites.
   - (U) Quarterly operational demonstrations of control segment IBUMCS capability at Gaithersburg IBM facility.
   - (U) Initial capability for constellation management/system station reporting will be in place at six operational test nodes.

Program Element: #0305165F
PE Title: Navstar Global Positioning System (GPS) Space/Conntrol

Project Number: NA
Budget Activity: 5 - Intelligence and Communications

3. (U) FY 1993 Planned Program:
   - (U) Operational satellite launches/on-orbit support will continue.
   - (U) Complete PDR, CDR, and begin coding for upgrade to ground control software to support Block IIR satellites.
   - (U) Continue upgrade of control segment required by PMRT and system turnover agreements. Also, control segment support operations to the on-orbit constellation and LEO operations will continue.
   - (U) Upgrade mainframe computers to support Block IIR satellites.

4. (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. The Block IIR satellite contractor is General Electric, East Windsor, NJ. Operational control segment development and deployment is being done by IBM, Federal Systems Division, 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 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: Block IIR design delayed due to survivability "operate through" issue. Nine month program impact, but this slip results in an Oct 95 first satellite delivery--no impact to launch schedule. First launch planned for FY 96.

3. (U) COST CHANGES: Added funds in FY 93 fund the General Electric "operate through" requirement ($23.2M).

F. (U) PROGRAM DOCUMENTATION:
   - (U) Decision Coordinating Paper 133 (Rev A), 17 Jan 78.
   - (U) System Operational Requirements Document, January 1990.

G. (U) RELATED ACTIVITIES:
   - (U) GPS development and operational implementation are joint activities. Air Force is Executive Agent. Air Force develops, procures, and operates space and control segments. Services jointly develop and procure user equipment through the Joint Program Office.
   - (U) Other agencies are the Army, Navy, Marine Corps, Defense Mapping Agency, Department of Transportation, North Atlantic Treaty Organization (NATO), and Australia.
   - (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.

Program Element: #0305165E
PE Title: Navstar Global Positioning System (GPS) Space/Control

Project Number: NA
Budget Activity: 5 - Intelligence and Communications

- (U) PE 0101221N, Fleet Ballistic Missile Systems, range positioning.
- (U) PE 0301357F and 0305913F (formerly 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) There is no unnecessary duplication of effort within the Air Force or DoD.

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

(U) Missile Procurement (BA23, P-35)

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | Total Program |
|---|---|---|---|---|
| Cost (satellites) | 155,964 | 186,845 | 247,549 | |
| Quant. (Order/Full Fund) | (0/0) | (4/4) | (6/6) | N/A |

(U) Other Procurement (BA 83, P-120)

| | | | | |
|---|---|---|---|---|
| Cost | 0 | 2,007 | 1,906 | 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 | Planned Date | Remarks |
|---|---|---|
| Control Segment Follow on OT&E | 1991 and 1993 | |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2907 Electronic Combat (EC) Intelligence Support | 1,824 | 1,840 | 1,900 | Continuing | TBD |
| Total | 1,824 | 1,840 | 1,900 | Continuing | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This project continues to support R&D efforts at the Foreign Aerospace Science and Technology Center (FASTC) supporting Air Force EC operations and aircrew training through the validation of threat emitter simulators (SIMVAL).

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

1. (U) Project 2907, Electronic Combat Intelligence Support:
The SIMVAL program evaluates the accuracy of threat emitter simulators to electronically replicate actual hostile emitters.

(U) FY 1991 Accomplishments:

- (U) Completed 13 validation reports, including AFEWES Reconfigurable Airborne Interceptor (RAI), Enhanced Surface-to-Air Missile Simulation (ESAMS) digital models, AFEWES Reconfigurable Surface-to-Air Missile (RSAM), AFDTC WEST-X, AFEWES Multiple Emitter Generator, AFEWES TWS-6, and AFEWES RAI Missile and Seeker.
- (U) Supported CROSSBOW-S review of validation reports, CROSSBOW-S Validator's Working Group, CROSSBOW-S C3 Working Group, and Joint Modeling and Simulation System (J-MASS) program in efforts to continue fulfilling OSD validation requirements for AF threat simulators.

Program Element: #0305887F Budget Activity: #4 - Tactical Programs
PE Title: Electronic Combat Intelligence Support

(U) FY 1992 Planned Program:
- (U) Continue conducting 25 validations of USAF developed threat simulators as required by the DOD Executive Committee on Threat Simulators (EXCOM).
- (U) Produce design specification, design and acquisition validation reports.
- (U) Continue to support DOD, CROSSBOW-S, and USAF committees, working groups, and programs affecting USAF simulator validation interests.
- (U) Ensure threat simulators accurately replicate foreign electronic combat threats to USAF weapon systems and aircrews.

(U) FY 1993 Planned Program:
- (U) Continue conducting 12 validations of USAF developed threat simulators as required by the EXCOM.
  (U) Produce design specification, design and acquisition validation reports.
- (U) Continue to support DOD, CROSSBOW-S, and USAF committees, working groups, and programs affecting USAF simulator validation interests.
- (U) Ensure threat simulators accurately replicate foreign electronic combat threats to USAF weapon systems and aircrews.

(U) Work Performed By:
The Foreign Aerospace Science and Technology Center (FASTC) at Wright-Patterson AFB, OH, performs SIMVAL tasks, using in-house and contract resources. FASTC does threat SIMVAL program tasks with the assistance of radar engineers Sverdrup Technology, Inc. of Tulahoma, TN, through their Dayton, OH, and Shaliman, FL, 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):
Not applicable.

(U) International Cooperative Agreements:
Not applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305905F
PE Title: Improved Space-Based TW/AA Systems

Budget Activity: # 3 Strategic Programs

Project Title: Improved Space-Based TW/AA Systems

POPULAR NAME: Improved Space-Based TW/AA Systems (Formerly known as FEWS)

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

| BUDGET ($000) | FY 1991* | FY 1992** | FY 1993*** | To Complete |
|---|---|---|---|---|
| Major Contract | 146,219 | 44,580 | 216,222 | TBD |
| Support Contract | 18,934 | 12,900 | 12,900 | TBD |
| In-House Support | 16,107 | 13,500 | 13,500 | TBD |
| GFE/ Other | 16,640 | 8,600 | 8,600 | TBD |
| Total | 197,900 | 79,580 | 251,222 | TBD |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | To Complete |
| Program Milestones | | M/S I DAB 12/91 | | |
| Engineering Milestones | | | SDR 1ST QTR | PDR 1995 CDR 1996 |
| T&E Milestones | | | TPAR 3RD QTR | |
| Contract Milestones | BSTS Contracts Complete 6/91 | RFP 2/92 AWD 6/92 | | |

* FY 1991 funding was placed in Defense Support Program, PE # 0102431F.

** FY 1992 funding is provided in PE # 0603425F.

*** Funding for FY 1993 and later is in PE # 305905F.

Program Element: #0305905F Budget Activity: # 3 Strategic
PE Title: Improved Space-Based TW/AA Systems Programs

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

The purpose of the Improved Space-Based, Tactical Warning/Attack Assessment (ISB, TW/AA) program (formerly known as the Follow-On Early Warning System or FEWS) is to select and develop a satellite system which provides increased performance over the existing Defense Support Program 1 satellite. The ISB, TW/AA spacecraft primary mission is to provide initial warning of a ballistic missile attack on the United States. The ISB, TW/AA satellite will incorporate new technologies that would enhance detection and reporting of ICBM/SLBM launches and improve space based surveillance of tactical ballistic missile launches worldwide. The ISB, TW/AA program consists of three parts: a Space Segment (SS), a Fixed Ground Segment (FGS), and a Survivable Ground Segment (SGS).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments (Work Accomplished under PE # 0102431F):
   - (U) Conducted End-to-End Ground Demonstrations of critical system components including the primary mission sensor and the on-board data processor
   - (U) Conducted off-line demonstrations of key system components including optics, focal plane, spectral filters, analog and digital electronics, higher order language software, thermal control, and communications links
   - (U) Conducted Tactical Warning/Attack Assessment (TW/AA) requirements trade studies and analyses
   - (U) Completed Boost Surveillance & Tracking System Dem/Val contracts

2. (U) FY 1992 Planned Program (To be Accomplished under PE # 0603425F):
   - (U) Award of two 24-month Demonstration/Validation phase contracts
   - (U) Continue to improve development and manufacturing capabilities required to produce the sensor focal plane
   - (U) Further development of non-volatile memories and analog circuits
   - (U) Study possibility of insertion of next generation data processing technologies

3. (U) FY 1993 Planned Program (To be Accomplished under PE # 0305905F):
   - (U) Continuation of Demonstration/Validation phase
   - (U) Intensive development of flight-like software code
   - (U) Fabricate and test critical optics components using state-of-the-art null lens techniques
   - (U) Define integration & testing requirements for on-board data processor
   - (U) Ground-based testing of the telescope system

4. (U) Program to Completion:
   - (U) Program accomplished under PE # 0305905F
   - (U) This is a continuing program

Program Element: #0305905F Budget Activity: # 3 Strategic
PE Title: Improved Space-Based TW/AA Systems Programs

D. (U) WORK PERFORMED BY:

The Program Executive Officer (PEO) for Space is responsible for system development and acquisition. Work during FY 1991 was performed by Lockheed Missiles and Space Company (LMSC) of Sunnyvale, CA and Grumman Aerospace Corporation (GAC) of Bethpage, NY. A Research and Development Sources Sought synopsis for the Demonstration/Validation phase of the FEWS program was issued in the Commerce Business Daily on 30 May 91. Potential prime contractors are LMSC, Raytheon Company of Wayland, MA, Hughes Aircraft Company of El Segundo, CA, Rockwell International Corporation of Seal Beach, CA, and Aerojet Electrosystems Company of Sacramento, CA.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

Not Applicable. No Descriptive Summary was submitted for FY 1992 since the DoD had zeroed the funding for the Advanced Warning System, as it was called then.

F. (U) PROGRAM DOCUMENTATION:

- (U) FEWS Statement of Operational Need (SON), 29 Jul 88
- (U) System Operational Requirements Document (SORD) for the Advanced Space-Based TW/AA System, 11 Oct 91
- (U) Joint Requirement Oversight Council Memorandum (JROC M-057-091), 18 Oct 91

G. (U) RELATED ACTIVITIES:

- (U) Program Element # 0102431F (Defense Support Program)
- (U) Program Element # 0305911F (Space Activities)
- (U) Program Element # 0603425F (Follow-On Early Warning System)
- (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) Program Element # 0102418F (Boost Surveillance & Tracking 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): Not Applicable.

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

Program Element: #0305905F
PE Title: Improved Space-Based TW/AA Systems

Budget Activity: # 3 Strategic Programs

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

| Event | Date | Results |
|---|---|---|
| End-to-End Ground Demonstrations | Jun 91 | Demonstrations were used to prove capability of key subsystems to work in a setting with other subsystems. Developed as part of BSTS Dem/Val & will be carried over to FEWS Dem/Val |

T&E ACTIVITY (TO COMPLETION)

| Event | Planned Date | Remarks |
|---|---|---|
| Technology Producibility Assessment Review (TPAR) | Jun 93 | Contractors prove key technical item producibility. Supports DAB Program Review required by ADM |
| Early Operational Assessment | Oct 93 | Supports MS II |
| Combined DT&E/IOT&E | FY 98-00 | Demonstrates satellite and ground system compatibility prior to launch of first satellite |
| Dedicated IOT&E | FY 01-03 | Supports MS III Decision to Procure Additional Satellites<br>Supports IOC Declaration |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305906F
PE Title: NCMC-TW/AA Systems
Budget Activity: # 3 - Strategic Programs

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991* Actual | FY 1992* Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 0001 CMU | 105,928 | 117,600 | 149,500 | 179,260 | 1,222,000 |
| 0002 Integrated TW/AA | 8,100 | 8,935 | 10,800 | Cont. | TBD |
| Total | 114,028 | 126,535 | 160,300 | Cont. | TBD |

*Formerly reported under Program Element #0102310F

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 will 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 Prime Minister of Canada, the Joint Chiefs of Staff, and the warfighting CINCs, with timely and reliable Command, Control, and Communication ($C^3$) systems capable of meeting TW/AA information needs into the next century.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305906F
PE Title: NCMC-TW/AA Systems
Project Number: 0001
Budget Activity: # 3 - Strategic Programs

A. (U) RESOURCES ($ in Thousands)

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| CMU | 105,928 | 117,600 | 149,500 | 179,260 | 1,222,000 |

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 functionally equivalent backup command center at Offutt Processing and Correlation Center (OPCC). The modernization achieved through these upgrades will also provide the capability to address the more refined 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 1991 Accomplishments:

- (U) Command Center Processing and Display System-Replacement (CCPDS-R) contractor, TRW, delivered Common Subsystem hardware and 80% software, Jan 91 (18 months early)
- (U) Communications System Segment Replacement (CSSR) unencrypted ("red") Technical Control Subsystem (TCS) achieved Initial Operational Capability (IOC), Apr 91
- (U) Space Defense Operations Center Phase 4B (SPADOC 4B) achieved IOC, Jul 91
- (U) CSSR Message Processing and Distribution Subsystem (MPDS) achieved IOC, Aug 91
- (U) Granite Sentry II (NORAD Command Center rehabilitation and missile warning displays) achieved IOC, Dec 91

2. (U) FY 1992 Planned Program:

- (U) Install CSSR encrypted ("black") TCS; award contract for CSSR at Offutt Processing and Correlation Center (OPCC)
- (U) Continue development of Survivable Communications Integration System (SCIS) software on new DEC hardware
- (U) Continue development of SPADOC 4C software for Version 1
- (U) Begin Development Test and Evaluation (DT&E) of CCPDS-R Common Subsystem with CSSR; install in Cheyenne Mountain.

Program Element: #0305906 Project Number: 0001
PE Title: NCMC-TW/AA Systems Budget Activity: # 3 - Strategic Programs

3. (U) FY 1993 Planned Program:
   - (U) Conduct IOT&E on Survivable Communications Integration System (SCIS), Communications System Segment Replacement (CSSR), and Command Center Processing and Display System-Replacement (CCPDS-R) Common Subsystem string
   - (U) Continue CCPDS-R development of Strategic Air Command (SAC) Subsystem and Processing & Display Subsystem (PDS)
   - (U) Conduct DT&E on Space Defense Operations Center (SPADOC) 4C Version 1; continue Version 2 development
   - (U) Develop and test Granite Sentry IV hardware/software in Cheyenne Mountain's Battle Staff Support Center (BSSC)
   - (U) Develop SCIS, CSSR, CCPDS-R subsystems for Offutt AFB
   - (U) FY93 increase due to peak overlap of above developments

4. (U) Program to Completion:
   - (U) CSSR IOC, FY94
   - (U) CCPDS-R and SPADOC 4C IOCs, FY95
   - (U) Granite Sentry, SCIS, OPCC IOCs and CMU FOC, FY96

D. (U) Work Performed By: Program office is at Air Force Systems Command Electronic Systems Division, Hanscom AFB, MA. MITRE Corporation, Bedford, MA, provides technical engineering support. Prime contractors--SCIS: E-Systems, St Petersburg, FL; SPADOC 4: Loral Command and Control Systems, Colorado Springs, CO; CSSR: GTE, Waltham, MA; CCPDS-R: TRW, Redondo Beach, CA; Granite Sentry: Martin Marietta Corp, DEC, Idaho National Energy Lab; OPCC: provided through other CMU systems' contractors.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: SCIS changed from obsolete TOLERANT hardware to state-of-the-art DEC hardware, due to technology and requirements changes.
2. (U) SCHEDULE CHANGES: Granite Sentry II Initial Operational Test and Evaluation (IOT&E) completed on schedule, but acceptance for Initial Operational Capability (IOC) was delayed 3 months to complete user training. SPADOC 4B IOC was delayed 3 months to add AFSPACECOM revisions of SPADOC 4A software to 4B. The SCIS installation will be delayed until software development is completed on new hardware. No change to CMU FOC schedule.
3. (U) COST CHANGES: No change to cost estimate. Changes to FY92 resources due to Congressionally directed reduction of Federally Funded Research and Development Center (FFRDC) contract costs. Resulted in reduction of $5.4 million to FY92 RDT&E appropriation. CMU FY93 RDT&E has been reduced by $7.2 million due to deflation adjustment and Defense Business Operations Fund (DBOF) assessment. In addition $9.0 million of FY93 RDT&E costs were moved out to FY94/FY95 due to SCIS acquisition strategy changes.

Program Element: #0305906 Project Number: 0001
PE Title: NCMC-TW/AA Systems 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, Change 1, 16 Sep 91
- (U) PMD 9247 (3)/0102310F, Cheyenne Mountain Upgrade (CMU) Program, 29 Mar 91
- (U) AFSPACECOM SORD for Cheyenne Mountain Upgrade (CMU) Program, 7 Aug 90
- (U) TEMP for Cheyenne Mountain Upgrade (CMU) Program, 29 Jan 91

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, which is now reported as Program Element 0305906F

- (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) 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 9,991 | 20,498 | 35,672 | 87,141 | 497,502 |

(U) Military Construction: Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. | (U) CSSR (additional operational capability) IOC | September 1994 |
| 2. | (U) Command Center Processing & Display System-Replacement (CCPDS-R) (all subsystems) Initial Operational Capability (IOC) | December 1994 |
| 3. | (U) Space Defense Operations Center (SPADOC) 4C IOC | August 1995 |
| 4. | (U) Granite Sentry (all phases) IOC | October 1995 |
| 5. | (U) Survivable Communications Integration System (SCIS) IOC | November 1995 |
| 6. | (U) Offutt Processing and Correlation Center IOC | November 1995 |
| 7. | (U) CMU Full Operational Capability (FOC) | December 1995 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305906F
PE Title: NCMC-TW/AA Systems
Project Number: 0002
Budget Activity: # 3 - Strategic Programs

A. (U) RESOURCES ($ in Thousands)

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| ITW/AA | 8,100 | 8,935 | 10,800 | Cont. | TBD |

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 1991 Accomplishments:
   - (U) Continued identifying all CMU system and program interfaces
   - (U) Continued resolving any potential interface disconnects
   - (U) Analyzed Survivable Communications Integration System options and their impact on other CMU and TW/AA systems
   - (U) Tracked acquisition performance to program baseline
   - (U) Kept System Executive Manager (AFSPACECOM/CC) informed via quarterly program reviews

2. (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 Command Center Processing and Display System-Replacement (CCPDS-R) and Communications System Segment Replacement (CSSR) during Development Test and Evaluation (DT&E)
   - (U) Analyze alternative engineering design strategies for Granite Sentry development
   - (U) Track acquisition performance to program baseline
   - (U) Keep System Executive Manager informed via quarterly program reviews.

3. (U) FY 1993 Planned Program:
   - (U) FY93 increase due to increased engineering problem resolution efforts anticipated during peak development and integration overlap of all six CMU systems.

Program Element: #0305906F
PE Title: NCMC-TW/AA Systems

Project Number: 0002
Budget Activity: # 3 - Strategic Programs

- (U) Continue identifying TW/AA system interfaces and resolving disconnects between CMU and other programs
- (U) Track acquisition performance to program baseline
- (U) Keep System Executive Manager informed via quarterly program reviews.

4. (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) 4C, and CCPDS-R installation and checkout in Cheyenne Mountain AFS
   - (U) Provide systems engineering/integration support to Strategic Air Command and other forward users for CCPDS-R subsystem installations
   - (U) Provide system analysis/integration support for CMU Full Operational Capability (FOC) checkout and final Defense Acquisition Board Program Review

D. (U) Work Performed By: Program office is at Air Force Systems Command's Electronic Systems Division (ESD). Technical support is provided by MITRE, Bedford, MA, Carnegie-Mellon Software Engineering Institute (SEI), Pittsburgh, PA, and CTA, Colorado Springs, CO.

E. (U) COMPARISON WITH FY 1992 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, Change 1, 16 Sep 91
   - (U) PMD 9247 (3)/0102310F, Cheyenne Mountain Upgrade (CMU) Program, 29 Mar 91
   - (U) AFSPACECOM SORD for Cheyenne Mountain Upgrade (CMU) Program, 7 Aug 90
   - (U) TEMP for Cheyenne Mountain Upgrade (CMU) Program, 21 Jan 91

Program Element: #0305906F
PE Title: NCMC-TW/AA Systems
Project Number: 0002
Budget Activity: # 3 - Strategic Programs

G. (U) RELATED ACTIVITIES: In accordance with Defense Acquisition Board (DAB) direction, Sep 89, this project was transferred from Program Element 0102313F to Program Element 0102310F which is now reported as Program Element 0305906.

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

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305909F
PE Title: Ballistic Missile Early Warning System (BMEWS)
Budget Activity: #3 - Strategic Programs

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

| Project Title Popular Name | FY 1991* Actual | FY 1992* Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| BMEWS | 17,801 | 16,823 | 7,100 | Cont. | TBD |

*Formerly reported under Program Element #0102423F

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 similar to Thule. Facility constuction was funded by the United Kingdom (UK).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Continued development for BMEWS modernization at the RAF Fylingdales, U.K. site.
   - (U) Conducted initial software Development Test and Evaluation (DOT&E) and equipment/facility integration testing.
   - (U) Completed hardware installation; began full power testing at radar site.
   - (U) Completed facility construction (UK funded).

2. (U) FY 1992 Planned Program:
   - (U) Conduct Initial Operational Test and Evaluation (IOT&E)
   - (U) Achieve Initial Operational Capability (IOC) for U.S. purposes.
   - (U) Conduct Joint Operational Capability (JOC) testing.

3. (U) FY 1993 Planned Program:
   - (U) Complete removal of equipment/property from old site.
   - (U) Complete Joint System Operational Capability (JSOC) testing.
   - (U) Resolve engineering problems identified in FY92 testing.

Program Element: #0305909F Budget Activity: #3 - Strategic Programs
PE Title: Ballistic Missile Early Warning System (BMEWS)

4. (U) Program to Completion:
   - (U) Support interface adjustments needed to meet Cheyenne Mountain Upgrade (CMU) Program requirements.
   - (U) Assess pre-planned product improvements.

D. (U) WORK PERFORMED BY: 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. The prime contractor is Raytheon Corporation, Wayland, MA. Major subcontractor is Control Data Corporation, Minneapolis, MN (computers).

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: No change to program estimated cost. Principal change program resources in FY92 is due to Congressionally directed reduction to Federally Funded Research and Development Center (FFRDC) contract costs. Change in FY93 cost estimate is due to deflation adjustment and a change to in the Defense Business Operations Fund (DBOF) assessment for this program.

F. (U) PROGRAM DOCUMENTATION:
   - (U) System Segment Specification for BMEWS Modernization of Site III Fylingdales, U.K., Volumes 1 and 2, ESD/BMEWS/3001A, 2 Nov 87
   - (U) AFSPACECOM SON 02-87, BMEWS Modernization (S/NF), 8 Apr 88
     Joint Program Management Plan, July 1988.
   - (U) System Operational Requirements Document (SORD) for the Ballistic Missile Early Warning System (BMEWS), 18 Mar 91.
   - (U) PMD 8035(14)/0102423F, Ballistic Missile Early Warning System (BMEWS), 18 Apr 91.

G. (U) RELATED ACTIVITIES:
   - (U) Program Element #0102432F (Sea Launched Ballistic Missile (SLBM) Radar Warning Systems).
   - (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) Program Element #0102423F (BMEWS)
   - (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

Program Element: #0305909F Budget Activity: #3 - Strategic Programs
PE Title: Ballistic Missile Early Warning System (BMEWS)

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

(U) Other Procurement (BA #3):

| Program | FY 1991* Actual | FY 1992* Estimate | FY 1993 Estimate | To Estimate | Total Complete |
|---|---|---|---|---|---|
| Cost | 336 | 0 | 0 | Cont. | TBD |

*Formerly reported under Program Element #0102423F

(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 | June 1988 |
| 2. | (U) Preliminary Design Reviews (PDR) complete | November 1988 |
| 3. | (U) Critical Design Reviews (CDR) complete | August 1989 |
| 4. | (U) Facility Beneficial Occupancy Date (BOD) | June 1991 |
| 5. | (U) Initial Operational Capability (IOC) | June 1992 |
| 6. | (U) Joint Operational Capability (JOC) | October 1992 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305910F
PE Title: SPACETRACK

Budget Activity: #3-Strategic Programs

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2295 Space Surveillance Network Improvement Program | 2,000 | 3,240 | 30,800 | TBD | TBD |
| 2296 Space Surveillance System Development | 400 | 1,000 | 2,300 | 3,900 | 7,800 |
| 3202 Air Force Maui Optical Station | 18,236 | 3,450 | 5,100 | TBD | TBD |
| 3887 Space Control Support | 3,599 | 5,775 | 14,900 | 21,600 | 51,985 |
| Total | 24,336 | 13,465 | 53,100 | Cont | TBD |

(Note: FY 92 and prior year funding included in PE 0102424F)

B. (U) BRIEF DESCRIPTION OF ELEMENT: SPACETRACK is a worldwide space surveillance network (SSN) of dedicated, collateral, and contributing optical, electro-optical, passive RF and radar sensors tasked to provide space object cataloging and identification, satellite attack warning, timely notification to US forces of satellite flyover, and scientific and technical intelligence gathering. The continued increase of satellite and orbital debris populations, as well as the increased use of different launch trajectories and geosynchronous altitudes necessitate upgrades to selected detection and tracking sensors. In addition, the age of SSN elements require upgrades to ensure supportability. SPACETRACK will provide the systems modifications necessary for command and control, targeting, and damage assessment for the U.S. Antisatellite (ASAT) system. The Advanced Electro-Optical System, a new 3.67 meter telescope upgrade for the Air Force Maui Optical Station (AMOS), was initiated in FY 91.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 93:

1. (U) Project 2296 Space Surveillance Systems Development:
Provides the architecture, technology, integration and implementation programs for the development and evaluation of new sensor systems for the SSN. Current emphasis is on a program to evaluate space based sensor contributions to the missions of the SSN.

(U) FY 1991 Accomplishments:
- (U) Completed preliminary design for ground processing system to integrate SDIO's space based visible experiment data into the surveillance system data processing flow.
- (U) Completed IOT&E of Saipan radar.

(U) FY 1992 Planned Program:

Program Element: #0305910F Budget Activity: #3-Strategic Programs
PE Title: SPACETRACK

- (U) Complete final design and begin fabrication and test for the hardware and software for the Space Based Visible data integration effort.

(U) FY 1993 Planned Program
- (U) Complete fabrication, integration, and test of the Space Based Visible ground processing system. Must be completed in FY 93 to support launch of the SDI's Midcourse Sensor Experiment in 1Q FY 94.

(U) Work Performed By: Space Systems Division, Los Angeles AFB, CA manages this project. Space Based Visible sensor contract effort is performed by Massachusetts Institute of Technology/Lincoln Laboratory. Systems engineering and technical support is provided by Aerospace Corporation, Los Angeles, CA.

(U) Related Activities:
- (U) Program Element #0102424F, SPACETRACK. This program element will be closed out at the end of FY 92 and the programmed funding transferred to program element #0305910F. This is an accounting transfer to a new program element only, no program content changes.
- (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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 1,800 | 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 R&D facility that provides measurement support to government and scientific communities, serves as a test bed for electro-optics and imaging technology, and supports operational space surveillance requirements. The basic operations and support funding for AMOS is provided through SPACETRACK RDT&E. Outside user support is provided through other development, measurement and experimental programs from various sources (e.g. SDIO, Intelligence, etc.). In addition to its primary R&D missions, this site provides critical operational data to Space Command with infrared signature data and compensated imaging data used for space object identification and mission/payload assessment, and space debris measurements that are unavailable at any other DOD site. The Advanced Electro-Optical System (AEOS) was initiated in FY91 per Congressional direction. The FY91 appropriation for AEOS fully

Program Element: #0305910F Budget Activity: #3-Strategic Programs
PE Title: SPACETRACK

funds the FY 91 and FY 92 program. Additional funding, in FY 93 and beyond, required to complete AEOS is not requested.

(U) FY 1991 Accomplishments:
- (U) Continued basic core funding for minimum site operations.
- (U) Initiated the AEOS program. Released telescope Request for Proposal (RFP) in Jul 91.

(U) FY 1992 Planned Program:
- (U) Continue basic core funding for minimum site operations.
- (U) Awarded AEOS telescope contract in 1QFY92.
- (U) Select final facility site for AEOS and award facility design contract.
- (U) Release facility construction RFP.

(U) FY 1993 Planned Program:
- (U) Continue basic core funding for minimum site operations.

(U) Work Performed By: Phillips Laboratory, Kirtland AFB, NM manages both the operation of the AMOS facility and the AEOS development. Rockwell Power Systems, Albuquerque, NM operates and conducts research and development at AMOS. Contraves USA, Pittsburg, PA is contracted to deliver the AEOS telescope.

(U) Related Activities:
- (U) Program Element #0102424F, SPACETRACK. This program element will be closed out at the end of FY 92 and the programmed funding transferred to program element #0305910F. This is an accounting transfer to a new program element only, no program content changes.
- (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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305910F
PE Title: SPACETRACK
Project: #2295
Budget Activity: #3-Strategic Programs

A. (U) RESOURCES ($ in Thousands)

| Project Title / Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Space Surveillance Network Improvement Program | 2,000 | 3,240 | 30,800 | TBD | 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 for U.S. satellites, maintenance of space order of battle, cover-up alerts, and identification/assessment of space objects. The Space Surveillance Network Improvement Program (SSNIP) develops and implements upgrades and improvements to the SSN to correct identified deficiencies in support of those mission requirements. SSNIP efforts include the Ground-based Electro-Optical Deep Space Surveillance System (GEODSS), Space Defense Command and Control System (SPADCCS), uncorrelated target (UCT) reduction, orbital debris research and measurement, communications/data link improvements, dedicated sensor upgrades, and system architecture analyses.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

2. (U) FY 1991 Accomplishments:
- (U) Continued "caretaker-only" status for the GEODSS Test Site (GTS) and minimal operation of the GEODSS Experimental Test Site (ETS).
- (U) Initiated SSNIP system engineering effort to establish a SSN technical baseline, evaluate and define improvements to meet space surveillance requirements and correct deficiencies.
- (U) Initiated orbital debris research and measurement effort to characterize the space debris environment. Demonstrated innovative small object tracking technique using the GEODSS ETS.
- (U) Initiated effort to evaluate alternatives to improve deep space surveillance capabilities and fill the coverage gap resulting from the failure to negotiate the GEODSS site 5 agreement with Portugal. Reducing overall operations and maintenance support costs of deep space surveillance are also key elements addressed by the study.
- (U) Initiated UCT study effort to decrease the number of uncorrelated targets reported by SSN sensors.

3. (U) FY 1992 Planned Program:
- (U) Complete study to identify deep space surveillance alternatives and award contract to implement preliminary design activities for the selected alternative. Contract award 3Q FY 92.
- (U) Continue minimal operation of the GEODSS ETS. The ETS will be used as a test bed for any GEODSS modifications or improvements resulting from the deep space study.

Program Element: #0305910F
PE Title: SPACETRACK
Project: #2295
Budget Activity: #3-Strategic Programs

- (U) Continue orbital debris research and measurement effort.
- (U) Complete UCT effort.
- (U) Complete systems engineering effort to define required sensor improvement programs for FY 1993 implementation. Studies will include alternatives to improve and optimize the existing near earth surveillance systems.

4. (U) FY 1993 Planned Program:
   - (U) Complete design and inititate manufacture and test of hardware/software for the deep space surveillance alternative. Contractor is at peak spend rate.
   - (U) Complete the orbital debris measurement task and perform a large analytical task to model and assess orbital debris effects on SSN and space system performance.
   - (U) Implement the UCT improvement at SSN sensors.
   - (U) Initiate development of astrodynamic standards to help standardize data products from SSN sensors.
   - (U) Initiate upgrades to the communications/data links of the SSN.
   - (U) Initiate upgrade to the Eglin radar signal processor.
   - (U) Initiate design and implementation of near earth surveillance alternatives.
   - (U) Initiate effort to improve accuracy of the star catalog data base.

5. (U) Program to Completion:
   - (U) This is a continuing program. As deficiencies are identified and validated, funding is programmed.

D. (U) Work Performed By: Electronic System Division, Hanscom AFB, MA. Contractors are TRW, Redondo Beach, CA; SAIC, Torrence, CA; and Rockwell Power Systems, Albuquerque, NM. MIT Lincoln Laboratories is fielding the HAX radar. Systems engineering and technical support is provided by MIT Lincoln Laboratory, Lexington, MA; Mitre Corp, Bedford MA; CTA, Bedford, MA; ARE, Bedford, MA; and Aerospace Corp, El Segundo, CA. Saipan radar deployment was contracted through Eastern Space and Missile Center and Western Space and Missile Center.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

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

F. (U) PROGRAM DOCUMENTATION:

- (U) AFSPACECOM SON 02-88, Space Surveillance, 13 Nov 89 (Secret).
- (U) AFSPACECOM SON 014-89, Space Object Identification, 6 May 91 (Secret).
- (U) USSPACECOM MNS 89-001, Dedicated Satellite Radar Imaging Capability (Secret).
- (U) Space Surveillance Network Improvement Program, PMD 7264(5), 29 Aug 91.
- (U) Cheyenne Mountain Upgrade Programs, PMD 9247(3), 29 Mar 91.
- (U) Mission Need Statement (MNS) Space Control Anti-Satellite Capability, 19 May 88 (Secret).

G. (U) RELATED ACTIVITIES:

Program Element: #0305910F
PE Title: SPACETRACK

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

- (U) Program Element #0102424F, SPACETRACK. This program element will be closed out at the end of FY 92 and the programmed funding transferred to program element #0305910F. This is an accounting transfer to a new program element only, no program content changes.
- (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.

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

(U) Other Procurement

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 634 | 469 | Cont | TBD |

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE: N/A.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305910F
PE Title: SPACETRACK
Project: #3887
Budget Activity: #3-Strategic Programs

A. (U) RESOURCES ($ in Thousands)

| Project Title<br>Popular Name | FY 1991<br>Estimate | FY 1992<br>Estimate | FY 1993<br>Estimate | To<br>Complete | Total<br>Program |
|---|---|---|---|---|---|
| Space Control Support -- ASAT BM/C3 and Surveillance | 3,599 | 5,775 | 14,900 | 21,600 | 51,985 |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The space systems of the Commonwealth of Independent States (CIS) represents a continuing threat to US land, naval, and aerospace forces, enabling over-the-horizon targeting of U.S. forces and command and control of their forces, and may be available to other U.S. adversaries. The increased access to space by other potential adversaries, including emerging third world nations, will enable them to have access to signficant force enhancement potential. The CIS continues to maintain an operational ASAT capable of attacking all US space systems in low earth orbit. These aspects could allow space forces to serve as an unacceptable force multiplier for a potential adversary's terrestrial forces. To prevent this and provide National Command Authorities with highly responsive and flexible options, the US will continue development and demonstration of the Army's kinetic energy (KE) interceptor technology in the near term and advanced weapons such as directed energy or high power microwave in the far term. The Air Force is lead agency for overall ASAT system architecture design, system engineering and integration, and end-to-end operational test as well as Battle Management/C3 (BM/C3) and Surveillance system development. This project will design the overall ASAT system architecture, including definition of all weapon system interfaces. ASAT requirements will be allocated to the weapon system elements including the KE weapon, the BM/C3 element, the Space Surveillance Network, Intelligence systems and other Cheyenne Mountain systems. These activities directly support near term KE ASAT design and prototyping activites. This project provides the planning necessary to protect the option to pursue deployment of an ASAT capability.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Restructured AF BM/C3 and Surveillance program to remain integrated with the Army's Kinetic Energy ASAT weapon program.
   - (U) Released ASAT System Architecture Definition and BM/C3 RFP.
   - (U) Began overall ASAT system integration and system engineering activities to define the ASAT system architecture and interfaces.
   - (U) Initiated the ASAT System Concept Definition.
   - (U) Continued low level ASAT simulation and prototyping effort.

2. (U) FY 1992 Planned Program:
   - (U) Award the ASAT system architecture definition contract. This activity directly supports the Army's KE ASAT program.

Program Element: #0305910F
PE Title: SPACETRACK
Project: #3887
Budget Activity: #3-Strategic Programs

3. (U) FY 1993 Planned Program:
   - (U) Continue ASAT architecture and interface definition through System Design Review (SDR)
   - (U) Support the Army's KE weapon program leading to a major decision review in FY94.

5. (U) Program to Completion:
   - (U) Complete ASAT architecture design. Document with top level ASAT system specification that allocates ASAT requirements to all weapon system elements and defines the weapon system interfaces.
   - (U) Complete ASAT system and Space Engagement Node (SEN) SDRs.
   - (U) Conduct combined demonstration of SEN and KE Weapon Control System prototypes in 3Q FY94.

D. (U) Work Performed By: Electronic System Division, Hanscom AFB, MA. Prime contractor has not been selected yet, plan 3QFY92 award. Systems engineering and technical support is provided by Mitre Corp, Bedford MA; and CTA, Bedford, MA.

E. COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: The Air Force program is restructured to be consistent with the Army's Kinetic Energy (KE) ASAT program, which was significantly reduced in the FY 1992 and 1993 President's Budgets. The overall ASAT program now focuses only on demonstrating a prototype of the Army's KE kill vehicle and Weapon Control System, and the Air Force's Space Engagement Node. The Air Force is deleting plans to carry the BM/C3 hardware and software development through Preliminary Design Review and deferring many major defense program activities.
2. (U) SCHEDULE CHANGES: Acquisition Milestone II has been deferred until after the major decision review in FY 94.
3. (U) COST CHANGES: Program cost estimate has been substantially reduced to reflect the downscoped program.

F. PROGRAM DOCUMENTATION:

- (U) Mission Need Statement (MNS) Space Control Anti-Satellite Capability, 19 May 88 (Secret).
- (U) USSPACECOM Multicommand Required Operational Capability (MROC) 03-87 for a Space Control ASAT Capability, Joint Chiefs of Staff, 5 Feb 88 (Secret).
- (U) AFSPACECOM System Operational Requirement Document (SORD) 003-89-1, ASAT BM/C3 and Surveillance System, 30 Oct 90 (Secret).
- (U) Acquisition Decision Memorandum (ADM), Anti-Satellite (ASAT) Systems, 6 Mar 89 (Secret).
- (U) Acquisition Decision Memorandum for Kinetic Energy Anti-Satellite (KE ASAT) Concept Definition Selection, 15 Dec 89 (Unclassified)
- (U) Acquisition Decision Memorandum for Kinetic Energy Anti-Satellite (KE ASAT) Milestone I Review, 16 Feb 90 (Unclassified)

Program Element: #0305910F
PE Title: SPACETRACK

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

- (U) Antisatellite (ASAT) Battle Management/Command, Control, Communications (BM/C3), Surveillance and Integration, PMD 4068(32),12 Sep 91 (Unclassified).

G. (U) RELATED ACTIVITIES:

- (U) Program Element #0102424F, SPACETRACK. This program element will be closed out at the end of FY 92 and the programmed funding transferred to program element #0305910F. This is an accounting transfer to a new program element only, no program content changes.
- (U) Program Element #0102310F, Cheyenne Mountain Complex Tactical Warning/Attack Assessment System).
- (U) Program Element #0603393A, Kinetic Energy ASAT Program.
- (U) Program Element #0603508F, Advanced Weapons Technology
- (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: None.

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. | (U) KE ASAT System Requirements Review | 2Q FY 92 |
| 2. | (U) ASAT System Design Review | FY 93 |
| 3. | (U) ASAT Major Decision Review | 3Q FY 94 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305911F
PE Title: Space Activities

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

A. (U) RESOURCES ($ in Thousands)

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Defense Support Program DSP | *72,226 | *51,141 | **57,719 | Cont | TBD |

*Previously funded in PE #0102431F. Total in FY 1991 includes an additional $197.900M dedicated to Follow-on Early Warning System (FEWS) development. **FY93 RDT&E funds for DSP are in R-1 line 86, "Space Programs."

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

The DSP system provides a spaced-based surveillance system to detect and report missile and space launches and nuclear detonations in near real time during pre-, trans-, and post-attack periods. 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 events. [ ]

This program element provides funding for development to modernize ground stations to ensure continued operability 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 1991 Accomplishments:
   - (U) Continued development to replace fixed ground station software architecture to complement new satellite capabilities (e.g., stereo processing, laser crosslink data processing, processing new sensor data, Ada-based language), and software maintenance and support programs.
   - (U) Began development to replace overloaded computers at the fixed ground stations. Completed initial installation and checkout of computers at contractor test facility.
   - (U) Continued development for mobile ground station hardware and software upgrades. Upgrades complete on mobile terminals #1 and #2.
   - (U) Continued the development to replace unsupportable satellite readout equipment at the fixed ground stations. Completed Critical Design Review.

Program Element: #0305911F
PE Title: Space Activities

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

2. (U) FY 1992 Planned Program:
   - (U) Launch DSP-16 from the Space Shuttle, demonstrating dual launch capability and assured access to space.
   - (U) Continue the development to replace fixed ground station software. Complete software coding.
   - (U) Continue the development to replace overloaded computers at the fixed ground stations. Complete qualification testing at contractor test facility.
   - (U) Continue development for mobile ground station hardware and software upgrades. Complete upgrades for mobile terminals #3 and #4.
   - (U) Continue the development to replace of unsupportable satellite readout equipment at the fixed ground stations. Begin installation and checkout at first site.

3. (U) FY 1993 Planned Program:
   - (U) Continue the development to replace fixed ground station software. Begin installation and checkout at first site.
   - (U) Continue the development to replace overloaded computers at the fixed ground stations. Begin installation and checkout at first site along with new software.
   - (U) Complete development for mobile ground station hardware and software upgrades. Complete upgrades for last two terminals, #5 and #6.
   - (U) Continue the development to replace unsupportable satellite readout equipment at the fixed ground stations. Complete installation and checkout for first two sites.

4. (U) Program to Completion:
   - (U) This is a continuing program until replaced by the FEWS program.
   - (U) Emphasis directed toward eliminating/minimizing operational deficiencies and vulnerabilities, maintaining on-orbit satellite constellation by satellite procurements and launches, insuring timely and accurate system performance, and insuring the supportability of the DSP ground system.
   - (U) Plan and execute the transition to the Follow-on Early Warning System (FEWS).

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 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: In lieu of upgrades to DSP beyond those programmed, the Air Force will pursue the FEWS program.
2. (U) SCHEDULE CHANGES: The completion of the replacement of ground computers

Program Element: #0305911F
PE Title: Space Activities

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

(Ground Computer Changeout) and software (System 1 Software) has been delayed to FY95 to allow adequate time for IOT&E, orderly installation of numerous ground station upgrades, and the long lead time for the procurement of shelters for the first installation.

3. (U) COST CHANGES: The RDT&E plus-ups for DSP upgrades have been deleted due to the new plans for FEWS.

F. (U) PROGRAM DOCUMENTATION:
- (U) DepSecDef memo to SecAF, DSARC I for Advanced Warning Systems (S), 15 Feb 80
- (U) SecDef memo to SecAF, MENS for Improved Missile Warning and Attack Assessment (S), 19 Mar 80.
- (U) DSP System Operational Concept (SOC) (S), 1 Dec 87.

G. (U) RELATED ACTIVITIES:
- (U) Program Element #0102431F (Defense Support Program).
- (U) Program Elements #0604325F/0305905F (Advanced Warning System/Improved Space-Based TWAA Systems)
- (U) Program Elements #0603735F/0303605F (Defense Satellite Communications System/Satellite Communications Terminals)
- (U) Program Element #0303601F (Milstar AF Terminals)
- (U) Program Elements #0305144F/0305171F/0305138F (Titan Space Boosters/Space Launch Support/Upper Stages program)
- (U) Program Elements #0102310F/0102313F (Cheyenne Mountain Upgrade Programs/Integrated TW/AA System)
- (U) Program Element #0305110F (AF Satellite Control Network)
- (U) Program Element #0604766A (Tactical Electronic 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):

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Missile Proc (BA 45) | | | | | |
| Cost | *326,246 | *64,322 | 286,694 | Cont | TBD |
| Quantity (satellites) | 1 | 0 | 0 | 3 | 25 |
| Other Proc (BA 63) | | | | | |
| Cost | *74,213 | *58,018 | 67,556 | Cont | TBD |

*Previously funded in PE #0102431F

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

Program Element: #0305911F
PE Title: Space Activities

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

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. | (U) Complete upgrades to mobile ground stations | FY 1993 |
| 2. | (U) Complete Satellite Readout Station Upgrade | FY 1994 |
| 3. | (U) Complete Ground Computer Changeout | FY 1995 |
| 4. | (U) Complete System 1 Software | FY 1995 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305912F
PE Title: Sea Launched Ballistic Missile (SLBM) Radar Warning Systems
Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991* Actual | FY 1992* Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2887/PAVE PAWS | 2,242 | 850 | 1,000 | Cont. | 34,712 |

*Formerly reported under Program Element #0102432F

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. The system presently covers the historical Soviet submarine patrol areas for warning and assessment of SLBM attacks. This program element funds 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 FY 1993:

(U) Project number, Title: Project 2887, PAVE PAWS
The Pave Paws Upgrade Program (PPUP) at the Northeast and Northwest sites will enhance their mission capability and accrue life cycle cost savings by providing common equipment at all sites. An Intrusion Detection Alarm System (IDAS) at all sites will enhance security. Southeast auxiliary tracker will que the main radar to blank out one face while EED-equipped aircraft approach Robins AFB. FY92 RDT&E cost has changed due to Congressionally directed reductions to Federally Funded Research and Development Center (FFRDC) contract costs. FY93 RDT&E cost estimate is essentially unchanged.

(U) FY 1991 Accomplishments:
- (U) Conducted installation/on-site testing of ADP upgrades.
- (U) Began development of Automatic Face Blanking Modification (AFBM) at Robins AFB, GA.
- (U) Began on-site installation and testing of NW site ADP.
- (U) Completed development/testing of IDAS at NE and SW sites.

(U) FY 1992 Planned Program:
- (U) Conduct Development and Operational Test and Evaluation (DT&E/OT&E) for NW site upgrade IOC.
- (U) Retrofit NE/NW site software upgrades to SE/SW sites.
- (U) Complete testing at SE and NW sites for IDAS IOC.
- (U) Complete installation/testing of Automatic Face Blanking Modification (AFBM) at SE site for IOC.

Program Element: #0305912F
PE Title: Sea Launched Ballistic Missile (SLBM) Radar Warning Systems

Budget Activity: #3 - Strategic Programs

(U) FY 1993 Planned Program:
- (U) Resolve engineering problems identified in FY92 testing.
- (U) Support interface adjustments needed to meet Cheyenne Mountain Upgrade (CMU) Program requirements.
- (U) Assess pre-planned product improvements.

(U) Work Performed By: 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. The prime contractor is Raytheon Corporation, Wayland, MA. Major subcontractors are Control Data Corporation, Minneapolis, MN (computers), and TRW, Redondo Beach, CA (software).

(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) Program Element #0102432 (SLBM Radars)
- (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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 10 | 0 | 951 | Cont. | TBD |

(U) Military Construction: Not Applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305913F*
PE Title: Nuclear Detonation (NUDET) Detection System (NDS)
Project Number: # 0001
Budget Activity: #3-Strategic Programs

* Formerly PE #0102433F. Beginning with FY 1993, all numbers are contained in this new PE. FY 1991 and FY 1992 are still in PE #0102433F.

A. (U) RESOURCES ($ in Thousands)

| Project Title Popular Name | FY 1991 Actual | FY1992 Estimate | FY1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Nuclear Detonation Detection System (NDS) | 23,061 | 6,804 | 5,200 | 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. 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 funds development 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 1991 Accomplishments
   - (U) Initiated design definition of low cost Ground NDS Terminals (GNTs).
   - (U) Completed integration/testing of the Ground/Airborne Integrated Terminal (G/AIT).
   - (U) Continued engineering development and requalification of NDS sensors to install into GPS Block IIR satellites.
   - (U) Completed design of NDS electromagnetic pulse sensor.
   - (U) Delivered fifth G/AIT.

2. (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 design to integrate ground terminals in SAC and AFSPACECOM mobile command posts.
   - (U) Closeout G/AIT development contract.
   - (U) Begin production phase of NDS electromagnetic pulse sensor.

Program Element: #0305913F
PE Title: NDS

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

3. (U) FY 1993 Planned 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.
   - (U) Begin development of reprocurement package for ground terminal production program.

4. (U) Program to Completion:
   - (U) This is a continuing program. Sensors will be developed and procured for all future GPS satellites. Mobile terminals will be planned, developed, and procured as directed.

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 assistance of the [redacted] 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, Torrance, 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. International Telephone and Telegraph (ITT) Aerospace and Communications Division, Nutley, NJ, is under contract to Sandia National Laboratory to develop the electromagnetic pulse sensor for Block II replenishment satellites.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: The G/AIT terminals will not be upgraded for installation on the E-4B NEACP aircraft due to cost and support decisions in the Spring of 1991.

2. (U) SCHEDULE CHANGES: Ground terminal prototypes will be delivered in FY94, with production unit deliveries starting in FY95. The Block IIR electromagnetic pulse sensor production is delayed due to sensor design problems, but still supports the satellite launch schedule.

3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:
   - (U) System Operational Requirements Document 004-77-I/II/III, 17 March 91.
   - (U) Program Management Directive 6112(142), 1 March 91.

G. (U) RELATED ACTIVITIES:
(U) PE 0305165F, Navstar Global Positioning System (GPS) Space Segment.
(U) [redacted]
(U) PE 0301357F, NUDET Detection System (NDS)
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

Program Element: #0305913F
PE Title: NDS

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

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

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

| | FY 1991 Actual | FY1992 Estimate | FY1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 29,044 | 32,048 | 49,317 | Cont | TBD |
| Quantities | 0 | 4 | 6 | Cont | TBD |

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

J. (U) MILESTONE SCHEDULE:

| | |
|---|---|
| 1. Complete Ground Terminal Prototype Design | Dec 93 |
| 2. Begin Ground Terminal Prototype Deliveries | Dec 93 |
| 3. Launch first Block IIR satellite with upgraded NDS sensors | 1996 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0401216F Budget Activity: 4. Airlift Programs
PE Title: Airlift Mission Activities (Non IF)

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 634138 Airlift Mission Activities (Non IF) | 0 | 0 | 6800 | 22700 | 29500 |

B. (U) BRIEF DESCRIPTION OF ELEMENT: Provides for operations and support of worldwide airlift for the President, Vice-President, Cabinet, Congress, and other dignitaries of the US government and its allies. Weapon systems include the VC-25A, VC-137B/C, VC-135B, C-20A/B and the VC-9C. Contains authorization and funding for the aircraft, flying hours, military and civilian personnel.

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

1. (U) Project Number, Project Title: 634138, Airlift Mission Activities (Non IF): The described effort refers to the VC-137 replacement program. This program is designed to replace the seven aging VC-137B/C fleet at Andrews AFB with commercial derivative aircraft, missionized with executive interiors and an enhanced communications system. The current VC-137s are 1950/60 technology and are increasingly difficult to maintain and support. FY93 funds are required to conduct a source selection and begin design and integration efforts for an improved communications package.

(U) FY 1991 Accomplishments: N/A

(U) FY 1992 Planned Program: N/A

(U) FY 1993 Planned Program:
- (U) Conduct Source Selection Activities
- (U) Begin design and integration efforts for improved Mission Comm System

(U) Work Performed By: TBD; Aeronautical Systems Division (ASD) will be the implementing organization.

(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 Account (BA 4, Airlift Programs)

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 7008 | 0 | Cont | TBD |
| (QTY) | (0) | (0) | (0) | Cont | TBD |

(U) International Cooperative Agreements: Not Applicable

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0401840F Project: N/A
PE Title: Military Airlift Command Budget Activity: #4 - Tactical Programs
Command & Control (MAC C2)
Project Title: Information Processing System (IPS)

POPULAR NAME: MAC C2 IPS

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

| BUDGET ($000) | FY 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| Major Contract | 6.873 | 7.275 | 7.617 | (TBD) |
| Support Contract | 3.423 | 3.056 | 3.023 | (TBD) |
| In-House Support | 972 | 624 | 762 | (TBD) |
| GFE/ Other | 92 | 0 | 0 | (TBD) |
| Total | 11.360 | 10.955 | 11.400 | (TBD |

| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | (To Complete) |
|---|---|---|---|---|
| Program Milestones | MAISARC IPR Sep 91 | MAISRC II/ III -May 92 IOC-Jun 92 | N/A | FOC FY 96 |
| Engineering Milestones | N/A | Crit. Design Rev. Incr 2 Jan 92 | Crit. Design Rev. Incr 3 Nov 92 | Crit. Design Rev. Incr 4 Nov 93 |
| T&E Milestones | N/A | OT&E Incr 1 Mar 92 DT&E Inc 2 Aug 92 | OT&E Incr 2 Oct 92, DT&E Inc 3 Apr 93 OT&E Aug 93 | DT&E Incr 4 Apr 94 OT&E Inc 4 Aug 94 |
| Contract Milestones | N/A | S/W Spec Review Inc 2 Oct 92 | S/W Spec Review Inc 3 Aug 93 | S/W Spec Review Inc 4 Aug 94 |

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 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 four increments. Increment 1 will provide a digital data message handling capability at each IPS node and implement mission execution monitoring. Increment 2 will build on Increment 1 software to support mission planning and scheduling. Increments 3 & 4 will augment the planning and scheduling capabilities of Increment 2 as well as install Satcom communications interfaces and multi-level security features.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

2. (U) FY 1991 Accomplishments:
   - (U) Completed development, procurement and fielding of 14 pre-Increment 1 systems to support Desert Shield, known as HAVE IPS.
   - (U) Conducted AISARC/MAISRC In Process Review.
   - (U) Procured systems for 2 non-Desert Shield nodes (Increment 1 software). Total 16 nodes.

3. (U) FY 1992 Planned Program:
   - (U) Initiate Increment 2 software development.
   - (U) Initiate Increment 3 software development.
   - (U) Procure system for 11 nodes (Increment 1 software).

4. (U) FY 1993 Planned Program
   - (U) Complete Increment 2 software development.
   - (U) Initiate Increment 4 software development.
   - (U) Procure system for 32 nodes (Increment 2 software).
   - (U) Upgrade software to Increment 2 at 27 previously installed nodes.
   - (U) Complete Increment 3 software development.

5. (U) Program to Completion:
   - (U) Complete Increment 4 software development and testing.
   - (U) Procure and install system at remaining 83 nodes.
   - (U) Upgrade all nodes to Increment 3, then Increment 4 software.
   - (U) Achieve Full Operational Capability in FY96.

D. (U) WORK PERFORMED BY: The IPS program is managed by Electronic Systems Division, Hanscom AFB MA. The IPS contractor is Computer Sciences Corporation (CSC), Moorestown, New Jersey.

Program Element: #0401840F Project: N/A
PE Title: Military Airlift Command Command & Control (MAC C2) Budget Activity: 4 - Tactical Programs

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: The IPS program was restructured from 3 incremental software deliveries to 4 increments to balance workload and schedule.

2. (U) SCHEDULE CHANGES: Due to Desert Shield and the fielding of HAVE IPS to 14 locations, IPS development was delayed approximately 9 months.

3. (U) COST CHANGES: Minor budget adjustments.

F. (U) PROGRAM DOCUMENTATION:

- (U) MAC SON 3-81 Mar 81
- (U) PMD 4040(8)/41840F Mar 91
- (U) SORD, MAC 03-81-II Jun 91

G. (U) RELATED ACTIVITIES:

(U) Program Element #0207438F, Wing Command and Control System (WCCS), is developing a wing level standard command and control system for the 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: PE 0401840F/(BA4)

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 6,531 | 7,178 | 20,422 | 60,437 | 98,616 |
| Quantity* | 12 | 8 | 26 | 96 | 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.

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 to Present | DT&E efforts were rephased to facilitate fielding an early IPS |

Program Element: #0401840F
PE Title: Military Airlift Command Command & Control (MAC C2)

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

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 | Mar 92 | Delayed 9 months due to Desert Shield and coding problems. |
| DT&E Inc 2 | Jun 92 | |
| DT&E Inc 2 | Aug 92 | |
| IOT&E Inc 2 | Oct 92 | |
| DT&E Inc 3 | Apr 93 | |
| IOT&E Inc 3 | Aug 93 | |
| DT&E Inc 4 | Apr 94 | |
| IOT&E Inc 4 | Aug 94 | |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0404011F Budget Activity: 4. Airlift Programs
PE Title: Special Operations Forces

A. (U) RESOURCES ($ in Millions)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 640002 C-130 Tactical Airlift Modernization | 0 | 0 | 2.0* | 37.8* | 39.8* |

* For C-130H acquisition not SOF; FY94 & out funds are being transferred to PE 0401115F (C-130 Airlift Squadrons)

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

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

1. (U) Project Number, Project Title: 640002, C-130 Tactical Airlift Modernization

This project augments funding for the C-130 Systems Requirement Working Group (SRWG). The SRWG is the long range system planning arm of the C-130 program office that studies function, requirements, and interface of systems (current and projected) for the C-130 aircraft. Through both inhouse support and independent contractors the SRWG will study the newly designed (FY92) C-130H Night Vision Instrumentation System (NVIS) cockpit (along with the peculiar equipment improvements) and its effects on crew workload, maintainability, and supportability. It will also look at current and future GFE subsystems and their compatibility with NVIS to include, if required, recommended modifications. Also conducted will be systems research to investigate trade-off studies for digitized engine instrumentation on C-130Hs and its effect on pilot workload, maintainability and supportability. Another area of study to improve the operational effectiveness of the C-130 is the cargo compartment--loading improvements (rails, etc.) can have payoff in aircraft loading/unloading times.

(U) FY 1991 Accomplishments: N/A

(U) FY 1992 Planned Program: N/A

(U) FY 1993 Planned Program:
- (U) Pursue contractual activities required for issuance of a study contract
- (U) Begin analysis on new C-130H NVIS cockpit workload and trade-off study for digitized engine instrumentation system

(U) Work Performed By: TBD; Warner-Robins Air Logistic Center will be the implementing organization.

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

(U) Other Appropriation Funds ( Millions):
- (U) Aircraft and Initial Spares Account (BA 4, Airlift Programs)

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 302.4* | 313.6 | Cont | TBD |
| (QTY) | (0) | (9)* | (8) | (149) | (166)* |

*Includes $44.5M for 1 HC-130H for ANG

(U) International Cooperative Agreements: Not Applicable

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| In-House Laboratory Independent Research | 7,180 | 7,946 | 9,806 | Cont | TBD |
| Total | 7,180 | 7,946 | 9,806* | Cont | TBD |

* The requested funding will allow the Air Force to emphasize the quality and effectiveness of its in-house basic research capability.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program provides funds for Air Force Laboratory Commanders/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 there be a high degree of flexibility prior to beginning work, relying on the technical judgement of each of the Laboratory Commanders/Directors. The laboratories annually report their achievements of the past year and the status of their projects to an Air Force evaluation panel chaired by the Air Force Systems Command Chief Scientist. Distribution of funds is based on the technical quality of the research presented each year.

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

(U) FY 1991 Accomplishments:

- (U) Developed photoacoustic and spectroscopic techniques which can simultaneously monitor the growth of microcracks in aircraft materials.
- (U) Created an automated aircraft design package by finite element analysis which has proved to be of great value in introducing both undergraduate and graduate aeronautical engineering students to computer-aided aircraft design.
- (U) Developed models for the evaluation of acceptable levels of coronary atherosclerosis which will allow pilots with mild levels of atherosclerosis to remain on flying status.
- (U) Measured electric fields by a variety of novel techniques with the objective of developing ways to protect missiles and spacecraft from lightning during launch.
- (U) Assessed the environmental impact and developed safe handling techniques for chlorotrifluoroethylene, a candidate hydraulic fluid for ultra-high-pressure systems in the advanced tactical fighter.
- (U) Discovered method for obtaining high quality superconducting films of yttrium/barium/copper/oxygen.

Program Element: #0601101F Budget Activity: #1 - Technology Base
PE Title: In-House Laboratory Independent Research

- (U) Designed and fabricated a reduced instruction set computer using stack frame concepts for high efficiency processing and cost savings in systems such as the F-16 modular mission computer.

- (U) Formulated and experimentally documented a new theory of spatial disorientation experienced by pilots in high performance aircraft.

(U) FY 1992 Planned Program:
- (U) The purpose of this Program Element is to support flexible and aggressive in-house research. The results of the FY 1991 program were reviewed by the Air Force technical evaluation panel.
- (U) Distribution of the FY 1992 funds was made based on panel findings of technical merit within the programs.
- (U) Selected research programs will continue into FY 1992.
- (U) New research programs will be selected by peer review within each laboratory.

(U) 1993 Planned Program:
- (U) The same management approach will be used as that used in FY 1992.

(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.

(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2301 Physics | 19,702 | 20,197 | 20,940 | Cont | TBD |
| 2302 Solid Mechanics and Structures | 10,859 | 10,363 | 11,851 | Cont | TBD |
| 2303 Chemistry | 24,161 | 24,490 | 27,600 | Cont | TBD |
| 2304 Mathematical and Computer Sciences | 23,786 | 23,355 | 27,528 | Cont | TBD |
| 2305 Electronics | 20,818 | 26,541* | 32,395 | Cont | TBD |
| 2306 Structural Materials | 23,326 | 9,883* | 11,172 | Cont | TBD |
| 2307 Fluid Mechanics | 14,260 | 14,034 | 15,770 | Cont | TBD |
| 2308 Propulsion | 11,184 | 9,102 | 12,457 | Cont | TBD |
| 2309 Terrestrial Sciences | 7,561 | 10,054** | 4,794 | Cont | TBD |
| 2310 Atmospheric Sciences | 11,505 | 7,543 | 8,473 | Cont | TBD |
| 2311 Space Sciences | 6,889 | 6,464 | 7,410 | Cont | TBD |
| 2312 Biological Sciences | 12,093 | 10,460 | 15,545 | Cont | TBD |
| 2313 Human Resources | 11,278 | 9,482 | 10,799 | Cont | TBD |
| 4113 Science and Engineering Education Programs | 0 | 15,357 | 17,180 | Cont | TBD |
| 4161 Defense Business Operations Fund (DBOF) | 0 | 9,100 | 13,500 | Cont | TBD |
| Total | 197,422 | 206,425 | 237,414 | Cont | TBD |

* Budget ramp changes are due to changing research emphasis and administrative change in project content; electromagnetic materials research has been moved to Project 2305, Electronics.
** Congress added $6.0 million specifically for seismic research.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program element, managed by the Air Force Office of Scientific Research (AFOSR), 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

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

technologies. These technologies include aerospace structures, aerodynamics, materials, propulsion, power, electronics, computer science, directed energy, conventional weapons, life sciences, and 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 protection, mitigation, and remediation technology.

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 Photonic Physics, Plasma Physics, Atomic and Molecular Physics, and X-ray Physics.

(U) FY 1991 Accomplishments:
- (U) Introduced and applied a rigorous, simple measure of laser beam quality, improving the performance tuning of laser devices and allowing more reliable design of laser beam transmission systems.
- (U) Entire visible spectrum produced from a single injected laser component, increasing the capacity of fiber-optic information transmission.
- (U) Developed new computational methods that provide dramatic supercomputer improvements.

(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) Investigate a computer-based plasma physics expert system to facilitate the modeling of complex plasma systems; study 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) Investigate wafer scale union, pioneering the idea that millimeter-wave integrated circuits can be optically interconnected for signal/phase distribution and control functions.
- (U) Study electro-optic generation of high power electromagnetic pulses for impulse radars.
- (U) Perform 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 Laboratory, 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) PE #0602203F, Aerospace Propulsion.
(U) PE #0602601F, Advanced Weapons.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2302, Solid Mechanics and Structures: This work produces the necessary scientific and technical knowledge for the design and operation of superior aerospace weapon systems and support installations. Research is conducted in structural dynamics, mechanics of materials, particulate mechanics, and structural mechanics. Future aerospace structures, airframes, space platforms, and engines will be constructed mainly from composite materials. The anisotopy, inhomogenity, and damage characteristics of these materials dictate the development of new solid mechanics and structural principles which are critical for performance prediction and material synthesis. Research in structures includes dynamics and stability, damage mechanisms, and response of structures and materials. Extreme service environment (space, blast, thermal, and electric-magnetic field) these structural systems must experience has made the development of fundamental solid mechanics theory a necessity.

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

(U) FY 1991 Accomplishments:
- (U) Modern stability research improved the understanding of nonlinear structural dynamic behavior.
- (U) Developed a three-dimensional model that quantifies the influence of debonding mechanisms on crack-growth resistance of ceramic composites.

(U) FY 1992 Planned Program:
- (U) Investigate the high temperature behavior of structural ceramics to accurately predict the response in jet engines, hypersonic vehicles, stealth technology, and space applications.
- (U) Investigate 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 Air Force Laboratories are conducting research under this project: Wright Laboratory, Wright-Patterson AFB OH; Phillips Laboratory, Kirtland AFB NM; the Air Force Civil Engineering Support Agency, 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, Berkeley CA; Purdue University, West Lafayette IL; Virginia Polytechnic University, Blacksburg VA; and University of Illinois, Urbana IL.

(U) Related Activities:
- (U) PE #0602102F, Materials.
- (U) PE #0602201F, Aerospace Flight Dynamics.
- (U) PE #0602206F, Civil Engineering and Environmental Quality.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

3. (U) Project 2303, Chemistry: Research in chemistry seeks the knowledge and understanding required to develop new materials as well as improved means to synthesize existing materials. Advances are sought in Air Force technological capabilities in structural and electronic materials, 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. Unique chemical approaches characterize polymeric and elastomeric materials, ceramics, glass, semiconductors, and composite structures. A detailed description is sought of atomic-level surface interactions that can limit performance of electronic devices and tribological materials. Separate but similar investigations of molecular energy release mechanisms and energy storage in metastable molecular systems foster advances in laser weapons development, new chemical propellants, and electrochemical power systems. Research continues to understand reaction chemistry in the upper atmosphere that controls the density of the ionosphere as well as the intensity and spectral distribution on infrared background radiation. The FY 1993 budget increase is primarily in optically active polymers.

(U) FY 1991 Accomplishments:
- (U) Developed a high performace rocket propellant by introducing lithium atoms into cryogenic solid hydrogen.
- (U) Optimized a molecular beam epitaxy technique for controlled growth of gallium arsenide compounds for use as electro-optical materials.
- (U) Demonstrated a novel nonlinear optical effect that transforms a monochromatic laser pulse into a multicolored pulse of coherent radiation.
- (U) Improved mechanical properties in ceramic-metal composites through biomimetic design.

(U) FY 1992 Planned Program:
- (U) Perform polymer research to emphasize new multifunctional micro-molecules that combine high mechanical strength with intrinsic electro-optical properties, with applications in aircraft structures and skins for detection of hostile aircraft and missiles.
- (U) Explore ceramics processing in order to pinpoint the basis for nanostructural design, to permit the fabrication of materials with the highest achievable toughness and strength.
- (U) Begin a research initiative aimed at understanding carbon oxidation and its inhibition to allow improvements in the useful temperature range of high-strength carbon-carbon composites.

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

(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) Develop 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.
- (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 Air Force organizations are conducting research under this project: Wright Laboratory, Wright-Patterson AFB OH; Phillips Laboratory, Kirtland AFB NM; the Air Force Civil Engineering Support Agency, 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 MA; SRI International, Menlo Park CA; and University of California, Los Angeles CA.

(U) Related Activities:
- (U) PE #0602102F, Materials.
- (U) PE #0602302F, Rocket Propulsion.
- (U) PE #0602601F, Advanced Weapons.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 2304, Mathematical and Computer Sciences: Mathematical and computer sciences research focuses on the discovery of 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: effective utilization of high-performance computers; 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; signal processing; 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. The FY 1993 budget increase allows research enhancement in neural nets and electromagnetic propagation, and new research approaches to computing and intelligent tutoring.

(U) FY 1991 Accomplishments:
- (U) Developed an advanced optimization technology to provide a potentially superior algorithm to train neural networks.
- (U) Developed new methods to shape the response of complicated nonlinear systems via feed back control.
- (U) Integrated processing and statistical analysis of multiresolution signals for improved data fusion and image recognition.
- (U) Discovered new reconstitution techniques for severely blurred images or degraded sensor photos.
- (U) Established computational methodology based on the olfactory system that is fast and learns from examples for use in multiple target tracking systems

(U) FY 1992 Planned Program:
- (U) Begin an initiative in the mathematics of hypersonics with emphasis placed on theoretical and associated numerical descriptions of nonlinear instabilities and transitions that accompany flight of hypersonic vehicles.
- (U) Study mathematical and computer science research issues in the area of advanced electronic fabrication, 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) A new program in computing with oscillators will begin.
- (U) New research approaches to intelligent teaching will be initiated.

(U) Work Performed By: The following Air Force organizations are conducting research under this project: Rome Laboratory, Griffiss AFB NY; Wright Laboratory, 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 MA; University of Illinois, Urbana IL; University of Maryland, College Park MD; University of North Carolina, Chapel Hill NC; and University of Wisconsin, Madison WI.

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

(U) Related Activities:
- (U) PE #0602201F, Aerospace Flight Dynamics.
- (U) PE #0602702F, Command Control Communication.
- (U) PE #0603728F, Advanced Computer Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 2305, Electronics: Research is conducted to provide the fundamental basis for developing future generations of electronic devices and systems that affect new Air Force technologies such as battle information management systems, integrated photonics, smart skins, and nonlinear optics. The goals are to increase the data and information processing speed of electronic systems, to firmly control their complexity and reliability, and to improve the security and reliability of information and data transmission. Research in this program is concerned with the understanding of fundamental principles that govern electronic processes which will enable the engineer to model and predict performance of electronic devices and systems. 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 control. The overall program is responsive to stated Air Force goals in brilliant weapons, tactical reconnaissance and intelligence, electronic combat, tactical warfare, surveillance, guidance, and control.

(U) FY 1991 Accomplishments:
- (U) Developed a unique cyclotron resonance spectroscopy system for determining the fundamental properties of artificially structured semiconductor materials.
- (U) Discovered a way to produce exceptionally high quality films of yttrium barium copper oxide on a high temperature superconductor.
- (U) Obtained record high microwave power output from a gallium arsenide field effect transistor (FET).
- (U) Developed high performance gallium antimonide-based devices.

(U) FY 1992 Planned Program:
- (U) Begin a new initiative on the newly discovered silicon-germanium alloys, with emphasis on advanced devices.

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

- (U) Establish ultra-high frequency applications of high-temperature superconductive electronics. 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) A new program in space-based, wide area surveillance radar will begin. This research supports the Air Force initiative in Space Subsystems Technology.

(U) Work Performed By: The following Air Force organizations are conducting research under this project: Rome Laboratory, Griffiss AFB NY; Wright Laboratory, 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) PE #0602204F, Aerospace Avionics.
- (U) PE #0602702F, Command Control Communications.
- (U) PE #0603728F, Advanced Computer Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 2306, Structural Materials: Materials research provides the knowledge for improving the performance, cost, reliability, and affordability of structural materials. The structural materials research program studies 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, alumina, zirconia, silicon carbide, silicon nitride, and carbon/carbon. Research in new processing methods and nondestructive evaluation of these materials complements research on materials properties. Direct goals of this program are to increase the thrust-to-weight ratios of engines, develop improved aerospace vehicle structural materials, and control or eliminate advance material reliability issues related to high temperature strength, toughness, fatigue, and environmental conditions.

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

(U) FY 1991 Accomplishments:
- (U) Developed diffusion barriers in high-temperature metal matrix composites which maximize the production of high quality output.
- (U) Established a technique to study nucleation and growth during chemical vapor depositon in order to improve composites.

(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) Develop an understanding of the effects of micro-structure 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) Perform research with strong emphasis on the understanding of atomic-level order/disorder transitions, advancing the 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, and lightweight materials for aircraft and spacecraft, with emphasis on mechanical properties, processability, reliability, and maintainability.

(U) Work Performed By: The following Air Force Laboratories are conducting research under this project: Wright Laboratory, 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 MA; University of Illinois, Urbana IL; Rockwell International, Thousand Oaks CA; Stanford University, Stanford CA; and Westinghouse Electric Corporation, Pittsburgh PA.

(U) Related Activities:
(U) PE #0602102F, Materials.
(U) PE #0603211F, Aerospace Structures Materials.
(U) PE #0708011F, Manufacturing Technology.

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 1991 Accomplishments:
- (U) Achieved control of compressor surge through development of a lumped parameter compressor model.
- (U) Enhanced turbine impingement cooling via total temperature separation induced by primary and secondary vortices.
- (U) Increased heat transfer near the base of turbine blades by utilizing vortex interactions

(U) FY 1992 Planned Program:
- (U) Develop 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) Begin 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; and concepts for the control of rotating stall and surge in engine compressors.

(U) FY 1993 Planned Program:
- (U) Broaden emphasis in computational fluid dynamics to the possibility of exploiting increased parallelism in emerging computer architectures for full vehicle flow simulation.

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

- (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 Air Force Laboratories are conducting research under this project: Wright Laboratory, 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 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) PE #0602102F, Materials.
(U) PE #0602201F, Aerospace Flight Dynamics.
(U) PE #0602203F, Aerospace Propulsion.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

8. (U) Project 2308, Propulsion: 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 a critically needed measurement capability for processes such as spray and solid propellant combustion and plasma propulsion.

(U) FY 1991 Accomplishments:
- (U) Demonstrated a new measurement technique for providing quantitative information on the temporal deviations occurring in three-dimensional gas-phase mixing processes.
- (U) Achieved a sustained quasi-steady plasma with a pulsed free electron laser.

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

(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; and 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 missile reentry technology will begin. This research will support the Air Force initiative in Ballistic Missile Technology.

(U) Work Performed By: The following Air Force 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; and Yale University, New Haven CT.

(U) Related Activities:
(U) PE #0602102F, Materials.
(U) PE #0602203F, Aerospace Propulsion.
(U) PE #0602302F, Rocket Propulsion & Astronautics.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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. Research in seismology is performed primarily to improve the Air Force's capability to monitor nuclear testing treaties. Seismology also has important applications for determining the effects of earthquakes, nuclear explosions, and other sources of ground motion on the degradation of Air Force systems using rapid site characterization and seismic hazard techniques. Research in

geodesy is required to determine the exact positions of targets with respect to missile launch sites. Gravity research is required to determine its effect on missile guidance systems along flight paths.

(U) FY 1991 Accomplishments:
- (U) Established seismic stations, arrays, and data collection networks in Asia through support provided to the US/USSR Joint Seismic Program (JSP) managed by the Incorporated Research Institutions for Seismology (IRIS).

(U) FY 1992 Planned Program:
- (U) Continue support to the JSP through IRIS.
- (U) Continue experimental and theoretical rock deformation studies to determine the effects of near-source rock properties on the propagation of seismic energy.
- (U) Improve high-altitude gravity estimation, satellite navigation, attitude control, and tracking using the Global Positioning System (GPS).
- (U) Complete studies begun in FY 1989 relative to seismic test yield estimation.

(U) FY 1993 Planned Program:
- (U) Initiate research efforts needed to resolve problems involved in discriminating between nuclear underground tests and other types of underground or surface explosions.
- (U) Continue geodesy and gravity research 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) Undertake research required to accurately determine location and depth of underground events, natural and man-made.

(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) PE #0602101F, Geophysics.
(U) PE #0602204F, Aerospace Avionics.
(U) PE #0602206F, Civil Engineering and Environmental Quality.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

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 1991 Accomplishments:
- (U) Established new polarization radar technique to predict electrical charge buildup in clouds that precedes triggered lightning.
- (U) Identified a natural phenomenon of acoustic wave generation by electron streaming along the earth's magnetic field lines as a cause for false satellite echoes in radar surveillance.

(U) FY 1992 Planned Program:
- (U) Basic research in battlefield 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 battlefield 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).

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

(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; and SRI International, Menlo Park CA.

(U) Related Activities:
(U) PE #0602101F, Geophysics.
(U) PE #0305160F, Defense Meteorological Satellite.
(U) PE #0603220C, Surveillance Acquisition, Tracking and Kill (SDI).
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

11. (U) Project 2311, Space Sciences: 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 the 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 1991 Accomplishments:
- (U) Transitioned space weather prediction and specification capability to Space Command, NORAD, and the Air Weather Service.
- (U) Established the conditions for particle trapping by electromagnetic waves leading to strategies for controlling electron populations responsible for discharge upsets in Air Force space assets.

(U) FY 1992 Planned Program:
- (U) Solar maximum observations and theoretical efforts will continue. Intensive modeling 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) Work will be performed to establish the coupling between the solar wind and the magnetosphere needed to establish global models for advanced space weather specifications.
- (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 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) PE #0602101F, Geophysics.
(U) PE #0602702F, Command Control Communication.
(U) PE #0603410F, Space Systems Environment .
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

12. (U) Project 2312, Biological Sciences: This project consists of three research efforts: environmental and general toxicology and effects of biohazards; neuroscience; and chronobiology. Environmental toxicology or environmental quality research has been expanded in order to provide the basic understanding of the fate and effects of Air Force chemicals and materials on the environment. This understanding is required in order to develop efficient and cost-effective strategies to clean up contaminated sections of air bases and to prevent future environmental contamination due to Air Force operations. Knowledge of the

mechanisms by which Air Force chemical and physical agents can cause toxic responses in organisms will allow the development of procedures to prevent toxicity and provide strategies for the development of new materials which will not be harmful to man or the environment. Basic research in neuroscience and chronobiology will result in new strategies to prevent G-induced loss of consciousness, impaired performance due to jet-lag and shift-work, and loss of life and aircraft due to stress, inattention, or lack of vigilance. Neuroscience research to develop computer architectures modeled after neuronal systems is aimed at providing powerful new approaches to machine intelligence. This project contributes to the DOD environmental technology initiative to enhance research in environmental protection and damage mitigation; FY 1993 funding level is $3,700 thousand.

(U) FY 1991 Accomplishments:
- (U) Demonstrated that environmental light can synchronize circadian rythmns.
- (U) Developed bacteria that alter the chemical state of toxic heavy metals resulting in their removal from solution.

(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) Examine 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) Conduct 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.
- (U) 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.

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

- (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.
- (U) Environmental quality issues pertaining to prevention and mitigation will receive additional emphasis.

(U) Work Performed By: The following Air Force 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) PE #0602202F, Human Systems Technology.
(U) PE #0602205F, Personnel, Training and Simulation.
(U) PE #0603231F, Crew Systems and Personnel Protection.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 1991 Accomplishments:
- (U) Developed and applied algorithmns and software to measure fundamental neurocognitive processes such as attention, memory language, and visuomotor function directly from brain waves.
- (U) Developed a new theory to explain the critical visual features in an environment used by human operators to maintain level flight, leading to new strategies for preventing spatial disorientation in pilots flying nap-of-the-earth missions.

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

(U) FY 1992 Planned Program:
- (U) Perform 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 to 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) PE #0602202F, Human Systems Technology.
(U) PE #0603231F, Crew Systems and Personnel Protection.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

14. (U) Project 4113, Science and Engineering Education Programs: In addition to the research conducted under the 13 scientific projects, Defense Research Sciences (DRS) funds are used by AFOSR to support several Science and Engineering Education programs, such as the Summer Faculty Research Program and the National Defense Science and Engineering Graduate Fellowships. These

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

programs are designed to strengthen the ability of universities to conduct research, and to educate scientists and engineers in technologies important to national defense. The research programs include funds for graduate assistants, research instrumentation, and exchanges of scientists and engineers with other research organizations, particularly DOD laboratories. Fellowships increase the number of graduate students in science and engineering. Upgrading university instrumentation enhance universities' research and education capabilities, as do scientific exchanges. The exchanges increase contacts between universities, industry, and DOD laboratories, maximizing the contributions of defense research to the nation's military and economic security. Although this is the first year that these programs have been collected into a separately titled project, several of them have been in existence for several years, supported by funds in the scientific projects, physics, chemistry, etc.

(U) FY 1991 Accomplishments:
- (U) Since its inception in 1987, 35 doctorate degrees have been conferred, sponsored by the Laboratory Graduate Fellowship Program.

(U) FY 1992 Planned Program:
- (U) Continue the Summer Faculty Research Program: approximately 150 university faculty members spend up to ten weeks in Air Force laboratories.
- (U) Continue the Graduate Student Research Program: approximately 100 students spend up to twelve weeks in Air Force laboratories.
- (U) Continue the University Resident Research Program: 24 university researchers work one to two years in Air Force laboratories.
- (U) Continue the Laboratory Graduate Fellowship Program: Air Force Laboratories sponsor approximately 25 graduate students for three or four years.
- (U) Support the National Defense Science and Engineering Graduate Fellowship Program: approximately 100 graduate students of which ten percent are set aside for members of an ethnic minority group under-represented in science and engineering.

(U) FY 1993 Planned Program:
- (U) Continue the FY 1992 programs at the same approximate levels.

(U) Work Performed By: Not Applicable.

(U) Related Activities:
(U) PE #0601103D, University Research Initiative.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

Program Element: #0601102F Budget Activity: #1-Technology Base
PE Title: Defense Research Sciences

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

15. (U) Project 4161, Defense Business Operations Fund (DBOF): Funding is required to the pay the Air Force portion of the operating costs of the Defense Technical Information Center (DTIC) and the 14 Information Analysis Centers which are administered by DTIC. This project is the consequence of a Technical Correction made in FY 1992 by Congressional committees.

(U) FY 1991 Accomplishments:
- (U) None.

(U) FY 1992 Planned Program:
- (U) Funding will be provided to DTIC on a monthly cycle of billing and reimbursement at a rate of one-twelfth of the total each month.

(U) FY 1993 Planned Program:
- (U) Funding will be provided to DTIC on a monthly cycle of billing and reimbursement at a rate of one-twelfth of the total each month.

(U) Work Performed By: Not Applicable.

(U) Related Activities:
(U) None.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602101F Budget Activity: #1 - Technology Base
PE Title: Geophysics

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 06GL Laboratory Operations | 23,005 | 23,542 | 23,378 | Cont | TBD |
| 3054 Infrared Target and Background Signatures | 2,230 | 2,017 | 2,557 | Cont | TBD |
| 4086 Space Subsystems Interactions | 0 | 0 | 900 | Cont | TBD |
| 4087 Ballistic Missile Interactions | 0 | 225 | 1,900 | Cont | TBD |
| 4643 Ionospheric Specification | 2,226 | 2,246 | 3,148 | Cont | TBD |
| 6670 Atmospheric Science and Technology | 904 | 1,157 | 1,879 | Cont | TBD |
| 7600 Terrestrial Geophysics | 602 | 642 | 815 | Cont | TBD |
| 7601 Space Effects on Air Force Systems | 3,699 | 4,626 | 4,345 | Cont | TBD |
| 7659 Aerospace Systems Technology | 1,095 | 584 | 742 | Cont | TBD |
| 7670 Optical/Infrared Properties of the Environment | 1,569 | 1,880 | 2,792 | Cont | TBD |
| Total | 35,330 | 36,919 | 42,456 | 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 includes environment modelling and simulation programs to enhance military system design capabilities in the conceptual development phase. Research efforts are also included in this element that will directly contribute to the environmental quality needs of the Air Force. 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.

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

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 1991 Accomplishments:
- (U) Validated the KC-10 and KC-135R infrared signature model.
- (U) Launched the Spacecraft Kinetic Infrared Test (SKIRT) payload.
- (U) Conducted three 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) Complete the celestial background descriptor code.
- (U) Begin development of an integrated optical background and transmission code for use as a system design tool.

(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) Complete climatology codes to assess atmospheric attenuation effects on target optical signatures.

(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 Aerodyne Research, Billerica, MA; Spectral Sciences, Inc., Bedford, MA; and General Research, Danvers, MA.

(U) Related Activities:
(U) PE 0305160F, Defense Meteorological Satellite Program.
(U) PE 0601102F, Defense Research Sciences.
(U) PE 0603707F, Weather Systems Advanced Development.

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0602101F Budget Activity: #1 - Technology Base
PE 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 1991 Accomplishments:
- (U) None.

(U) FY 1992 Planned Program:
- (U) None.

(U) FY 1993 Planned Program:
- (U) Measure radar clutter, amplitude, and phase scintillation effects which can limit SBR coherent integration.
- (U) Measure variabililty 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) 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) PE 0603428F, Space Subsystems Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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. 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.

(U) FY 1991 Accomplishments:
- (U) None.

(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.

Program Element: #0602101F Budget Activity: #1 - Technology Base
PE Title: Geophysics

(U) FY 1993 Planned Program:
- (U) Identify technology requirements for rapid characterization of the geophysical parameters of launch sites for dispersed mobile launch systems.
- (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) PE 0603311F, Ballistic Missile Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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. This project contributes to the DOD environmental technology initiative to enhance research in environmental protection and damage mitigation; FY 1993 funding level is $300 thousand.

(U) FY 1991 Accomplishments:
- (U) Demonstrated the use of ground-based lidar (laser radar) to obtain atmospheric density measurements up to 90 km altitude.
- (U) Delivered data for density above 140 km to the USAF Space Forecast Center.

(U) FY 1992 Planned Program:
- (U) Transition new measurements and techniques for real-time specification of C3I system outage.
- (U) Transition data for density from 90-140 km to the USAF Space Forecast Center.
- (U) Assess potential to enhance the performance of C3I systems through high-power ionospheric heating.
- (U) Initiate measurements of low latitude meteor burst propagation for survivable communications.

(U) FY 1993 Planned Program:
- (U) Validate ionospheric specification models for the USAF Space Forecast Center.
- (U) Launch Atmospheric Density Specification (ADS) experiment on the Space Test Program STEP-1 launch.

Program Element: #0602101F Budget Activity: #1 - Technology Base
PE Title: Geophysics

- (U) Complete ultraviolet radiance codes and incorporate into existing scene generation models.
- (U) Initiate fabrication of Density and Temperature Sounder (DATES) to obtain measurements in the 60-120 kilometer region.

(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) PE 0102417F, Over-the-Horizon Backscatter Radar Program.
(U) PE 0305160F, Defense Meteorological Satellite Program.
(U) PE 0601102F, Defense Research Sciences.
(U) PE 0603402F, Space Test Program.
(U) PE 0603707F, Weather Systems Advanced Development.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 global to microphysical scales and techniques to accurately measure atmospheric parameters worldwide. This project contributes to the DOD environmental technology initiative to enhance research in environmental protection and damage mitigation; FY 1993 funding level is $400 thousand.

(U) FY 1991 Accomplishments:
- (U) Implemented cloud detection and display technique at Air Force Global Weather Center to support Desert Storm.
- (U) Extended capabilities of Air Force Global Weather Prediction Models to account for Atmospheric processes involving moisture in support of Electro-Optical Weapons selection/delivery.

(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) Provide theatre-scale model for Storm Central Program.
- (U) Complete super microcomputer prediction model.

Program Element: #0602101F Budget Activity: #1 - Technology Base
PE Title: Geophysics

(U) FY 1993 Planned Program:
- (U) Complete DOD Cloud Information Compendium of models, data bases, and climatologies for systems design and war-gaming.
- (U) Complete electronic data board access to Cloud Reference Library.
- (U) Incorporate wind profiler data into weather analysis and evaluate its effects on short-range weather forecasts.
- (U) Develop first version of an improved algorithm for the Real-Time Nephanalysis (RTNEPH) model, and test the Numerical Weather Prediction model using cloud information from the RTNEPH model.

(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; Augsburg College, Minneapolis, MN; Science and Technology Corp., Hampton, VA; The Analytical Sciences Corp., Reading, MA; and ST Systems Technologies Inc., Lanham, MD.

(U) Related Activities:
(U) PE 0305160F, Defense Meteorological Satellite Program.
(U) PE 0601102F, Defense Research Sciences.
(U) PE 0603707F, Weather Systems Advanced Development.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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.

(U) FY 1991 Accomplishments:
- (U) Integrated Model II Superconducting Six-Axis Accelerometer with the Model III Superconducting Gravity Gradiometer.
- (U) Successfully field-tested the seismo-acoustic detection system for low-flying aircraft in the Arctic.

(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) Test the integrated Superconducting Six-Axis Accelerometer together with the Superconducting Gravity Gradiometer.

Program Element: #0602101F Budget Activity: #1 - Technology Base
PE Title: Geophysics

(U) FY 1993 Planned Program:
- (U) Deliver the design for the Superconducting Tensor Gravity Gradiometer for autonomous inertial navigation applications to Wright Labs.
- (U) Complete the 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) PE 0601102F, Defense Research Sciences.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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. 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 1991 Accomplishments:
- (U) Began analysis of CRRES data and development of space radiation effects models using these data.
- (U) Sensors for plasma density and temperature, energetic particles, and electric and magnetic fields launched on Defense Meteorological Satellite Program (DMSP) F10 satellite.

(U) FY 1992 Planned Program:
- (U) Complete static radiation belt data base from CRRES data.
- (U) Transition CRRES results on single event upsets to Space Systems Division.
- (U) Complete Mark II Active Mirror to increase resolution of solar observations at Sacramento Peak.
- (U) Complete solar mass ejection imager (SMEI) design and integration study.

(U) FY 1993 Planned Program:
- (U) Complete static radiation belt model.
- (U) Develop model to describe propagation of solar wind through interplanetary space.

Program Element: #0602101F Budget Activity: #1 - Technology Base
PE Title: Geophysics

- (U) Complete total energy deposition model.
- (U) Complete the magnetospheric specification and forecast model.

(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, Berkeley, 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) PE 0102431F, Defense Support Program.
(U) PE 0305160F, Defense Meteorological Satellite Program.
(U) PE 0601102F, Defense Research Sciences.
(U) PE 0603402F, Space Test Program.
(U) PE 0603410F, Space Systems Environmental Interactions Technology.
(U) PE 0603438F, Satellite Systems Survivability.
(U) PE 0603707F, Weather Systems Advanced Development.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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.

(U) FY 1991 Accomplishments:
- (U) Validated the Talos-boosted Aries sounding rocket system.
- (U) Completed design study of work-stations to expedite handling, transfer, and analysis of scientific data generated in experimental payloads.

(U) FY 1992 Planned Program:
- (U) Complete development tests of a Totally Integrated Payload Attitude Control Test (TIPACT) for 1000-lb payloads.
- (U) Plan development of a generic attitude control and guidance system for a small-payload sounding rocket test in FY 1994.
- (U) Continue testing for the development of a balloon-borne Global Positioning System (GPS) navigation receiver system with output data integrated into standardized telemetry data formats used for control and tracking of Air Force scientific balloon research platforms.

Program Element: #0602101F Budget Activity: #1 - Technology Base
PE Title: Geophysics

(U) FY 1993 Planned Program:
- (U) Complete fabrication and sub-system tests of a small payload sounding rocket attitude control and guidance system for a planned FY 1994 flight.
- (U) Complete integrated balloon-borne GPS navigation system with computerized ground station track and data display.
- (U) Flight test a new prototype super-pressure balloon with a special flight instrumentation system to verify performance.

(U) Work Performed By: This project is managed by and is the technical activity of the Weapons and Survivability Directorate of AFSC's Phillips Laboratory, Hanscom AFB, MA. The contractors: are Wentworth Institute of Boston, Boston, MA; Boston College, Chestnut Hill, MA; and SIE, Lexington, MA.

(U) Related Activities:
(U) PE 0305160F, Defense Meteorological Satellite Program.
(U) PE 0601102F, Defense Research Sciences.
(U) PE 0603402F, Space Test Program.
(U) PE 0603410F, Space Systems Environmental Interactions Technology.
(U) PE 0603707F, Weather Systems Advanced Develoment.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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. This project contributes to the DOD environmental technology initiative to enhance research in environmental protection and damage mitigation; FY 1993 funding level is $400 thousand.

(U) FY 1991 Accomplishments:
- (U) Completed modeling of atmospheric turbulence and the global aerosol climatology studies.
- (U) Released the Phillips Laboratory, Geophysics Directorate-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.

Program Element: #0602101F Budget Activity: #1 - Technology Base
PE Title: Geophysics

- (U) Add infrared measurements of the earth's limb to infrared background models.
- (U) Develop a balloon-borne aerosolsonde.
- (U) Complete models that characterize turbulence-induced effects on atmospheric transmission of electromagnetic signals.

(U) FY 1993 Planned Program:
- (U) Complete new eye-safe lidar for atmospheric characterization measurement from the Flying Infrared Signatures Technology (FISTA) research aircraft.
- (U) Develop interface model for the Spectral Infrared Images of Targets and Scenes (SPIRITS) code.
- (U) Complete a comprehensive spectroscopic data base of atmospheric trace constitutent species and add these data to appropriate radiative transfer 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: Utah State University, Logan, UT; Univ. of So.Cal, Los Angeles, CA; Univ. of Arizona, Tucson, AZ; Univ. of Wyoming, Laramie, WY; Photometrics, Woburn, MA; Mission Research, Nashua, NH; and Univ. of Mass., Amherst, MA.

(U) Related Activities:
(U) PE 0305160F, Defense Meteorological Satellite Program.
(U) PE 0601102F, Defense Research Sciences.
(U) PE 0603402F, Space Test Program.
(U) PE 0603707F, Weather Systems Advanced Development.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 06ML Laboratory Operations | 21,011 | 21,452 | 27,413 | Cont | TBD |
| 2417 Thermal Protection Materials and Structures | 3,210 | 3,662 | 4,506 | Cont | TBD |
| 2418 Metallic Structural Materials | 15,814 | 17,102 | 20,327 | Cont | TBD |
| 2419 Nonmetallic Structural Materials | 5,289 | 5,711 | 6,167 | Cont | TBD |
| 2420 Aerospace Propulsion Materials | 5,702 | 4,791 | 5,315 | Cont | TBD |
| 2421 Fluids, Lubricants and Elastomeric Materials | 1,975 | 2,345 | 2,545 | Cont | TBD |
| 2422 Protective Coatings and Materials | 3,849 | 4,225 | 5,477 | Cont | TBD |
| 2423 Electromagnetic Windows and Electronic Materials | 5,007 | 5,847 | 6,329 | Cont | TBD |
| 4084 Strategic Missile Materials | 0 | 3,100 | 5,000 | Cont | TBD |
| 4085 Space Subsystem Materials | 0 | 0 | 1,700 | Cont | TBD |
| TOTAL | 61,857 | 68,235 | 84,779 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Program Element contains the entire Air Force Exploratory Development program in materials and processing 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. 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. Project 4084, Ballistic Missile Materials, initiated in FY 1992, develops materials for application to strategic missiles. Project 4085, Space Subsystem Materials, will be initiated in FY 1993 to develop materials for space subsystems such as spacecraft bus structures and phased array antenna backup structures. Additional funding was provided in FY 1993 to support DOD Science and Technology Thrusts. Additional funding consists of $ 1.0 million for Global Surveillance and Communication Thrust, $2.0 million for Precision Strike Thrust and $1.3 million for Environmental Quality Special Emphasis.

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06ML, Laboratory Operations: Provides management and operational support for the Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH. Includes: pay and benefits for civilian scientists, engineers, and support personnel; travel; transportation; rents; communications; utilities; supplies and equipment; contractor support services; and salaries, travel, and equipment for laboratory contracting support personnel.

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. This project supports the joint DOD Advanced Technology Demonstrations for Precision Strike.

(U) FY 1991 Accomplishments:
- (U) Demonstrated pin insertion technique to locally strengthen two dimensional CCCs, allowing thinner structures in attachment areas and conventional composite attachment techniques.
- (U) Demonstrated computer program module that combines design of CCC structures with material selection/process information.

(U) FY 1992 Planned Program:
- (U) Continue computer program effort to verify materials/process selection methods and evaluate process control sensors.
- (U) Develop procedures to reduce processing times of CCCs and polymer precursors of coatings/matrix inhibitors by an order of magnitude.
- (U) Evaluate optical coatings for reduced thermal effects.

(U) FY 1993 Planned Program:
- (U) Define critical failure modes of oxidation resistant (OR) CCCs and develop coating/inhibition techniques to eliminate the failure modes.
- (U) Develop processing science for applying OR coatings on CCCs for turbine engines/high Mach airframe applications.
- (U) Define joining/attachment concepts for CCC space structures.
- (U) Develop high reliability, low-cost materials for structural components in support of precision strike.

(U) Work Performed By: The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages the project. Major contractors are: Textron Inc/Avco Defense Systems, Lowell, MA; General Electric, Valley Forge, PA; General Electric, Cincinnati, OH; Nichols Research Corp, Huntsville, AL; and Science Applications International Corp, Santa Ana, CA.

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

(U) Related Activities:
- (U) Program Element #0603112F, Advanced Materials for Weapons Systems.
- (U) Program Element #0603211F, Aerospace Structures.
- (U) Program Element #0708011F, Industrial Base Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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, strategic, and hypersonic vehicle structures, turbine engines, and missiles. Develops processes for making these materials, engineering properties, and repair and nondestructive inspection (NDI) technologies. Applies advanced computer technology to develop self-directing and self-improving integrated design and manufacturing control techniques, such as the Quantitative Process Automation (QPA) control technique, to significantly lower the costs of using the advanced materials developed in this program element. Funding increase in FY 1993 is due to increased emphasis on very high temperature aluminum alloys, aluminum-lithium alloy process development, and joining concepts. This project supports the DOD Special Emphasis on Environmental Quality.

(U) FY 1991 Accomplishments:
- (U) Developed chemical vapor deposition fiber production technology for MMC reinforcement fibers.
- (U) Completed solid state X-ray imaging technology for PE #0603112F effort on portable real-time filmless X-ray NDI system.
- (U) Investigated detection limits of dual-energy computed tomography for finding hidden cracks under fasteners.
- (U) Applied QPA to molecular beam epitaxial growth of semiconductor/electro-optical materials and obtained more usable material with less variation in electrical and optical properties.
- (U) Completed over 120 failure analyses and mechanical property evaluations supporting various elements of Air Force Systems Command, Air Logistics Centers, and operational commands.

(U) FY 1992 Planned Program:
- (U) Develop more ductile gamma titanium aluminide alloys for turbine engines and hypersonic vehicles.
- (U) Identify process improvements to provide aluminum-lithium alloys with like properties in all three dimensions.
- (U) Identify NDI methods to find hidden corrosion.

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

- (U) "Train a computer" to autonomously develop relationships between molecular beam epitaxy (MBE) machine setup parameters and measured properties of the materials produced.
- (U) In conjunction with the pulsed laser deposition (PLD) effort in Project 2421, instrument the control system to implement self-directed Quantitative Process Automation (QPA) for improved film yield and less variability in film properties.
- (U) Complete joining/repair techniques for high temperature organic matrix composites; transfer to Air Logistics Centers.
- (U) Conduct field tests for a Kapton wire insulation replacement and a low temperature hydraulic fluid.

(U) FY 1993 Planned Program:
- (U) Complete evaluation of the damage tolerance behavior of alpha-2 titanium aluminides (alpha-2).
- (U) Complete developing coatings to protect alpha-2 from oxidation above 1200°F to survive operational environments.
- (U) Investigate relationships between reinforcing fibers, matrix materials, and their interfaces in gamma MMCs to obtain 1800°F capable materials.
- (U) Evaluate techniques to measure critical mechanical properties of materials with NDI in order to detect property deterioration during manufacturing or while in-service in weapon systems.
- (U) Complete QPA effort on MBE growth of electronic materials.
- (U) Couple a robotic manipulator with a QPA controlled PLD unit to coat complicated parts, such as a drill bit.
- (U) Demonstrate next-day-production of a machined part using an integrated product and process design system that provides a 7:1 productivity improvement.
- (U) Develop materials/processes/equipment for on-aircraft repair of large area damage (6 inches or more in diameter) on advanced composite structures.
- (U) Evaluate techniques for hazardous and toxic materials and processes replacement in support of environmental quality.

(U) Work Performed By: The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages the project. 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.

(U) Related Activities:
- (U) Program Element #0603112F, Advanced Materials for Weapons Systems.
- (U) Program Element #0603211F, Aerospace Structures.
- (U) Program Element #0708011F, Industrial Base Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

(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 fabrication processes for aerospace structural applications at cryogenic temperatures to 700°F. Focuses on reducing weight and cost while increasing stiffness, strength, thermal resilience, and durability. Also develops ordered polymer films, molecular composites (materials reinforced with rigid rod molecules), and signature reduction materials.

(U) FY 1991 Accomplishments:
- (U) Developed high temperature transparent polymers with use temperatures 100°F higher than current state-of-the-art.
- (U) Developed an advanced carbon fiber having mechanical properties superior to any of the fibers currently available.

(U) FY 1992 Planned Program:
- (U) Complete development of first generation ultra lightweight composites that are 40% lighter than current composites.
- (U) Develop aircraft canopy materials from the high temperature transparent polymers completed in FY 1991.
- (U) Identify methods to lower costs of making composite structures.

(U) FY 1993 Planned Program:
- (U) Complete development of methods to significantly improve the compressive strength of ordered polymer fibers for composite materials.
- (U) Scale up and develop conductive polymer systems having significantly higher conductivity and stability.
- (U) Apply Quantitative Process Automation (QPA) to processing of composite parts to control dimensional tolerances.
- (U) Transition third-generation molecular composite approaches developed in-house to contractual efforts.

(U) Work Performed By: The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages the project. The major contractors are: University of Dayton, Dayton, OH; Northrop Corporation, Hawthorne, CA; Dow Chemical Co, Midland, MI; General Dynamics, San Diego, CA; and Systems Research Laboratories, Dayton, OH.

(U) Related Activities:
- (U) Program Element #0603112F, Advanced Materials for Weapons Systems.
- (U) Program Element #0603211F, Aerospace Structures.
- (U) Program Element #0708011F, Industrial Base Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 2420, Aerospace Propulsion Materials: Develops advanced intermetallic (IM) alloys and metal matrix composites (MMCs), ceramic matrix composites (CMCs), and processes to make lightweight uncooled turbine engine components used at very high temperatures. Improves engine producibility, durability, thrust-to-weight, life cycle costs, and fuel efficiency.

(U) FY 1991 Accomplishments:
- (U) Identified promising high temperature (above 2500°F) ceramic fiber candidates for use in CMCs.
- (U) Developed new processing methods that provide extruded gamma titanium aluminides with the desired ductile properties.

(U) FY 1992 Planned Program:
- (U) Develop improved IM matrix materials for high performance turbine engine MMCs with balanced room temperature damage tolerance and high temperature strength.
- (U) Evaluate the ability to make the fibers identified in FY 1991 in lab-size quantities and determine if they have usable mechanical properties.

(U) FY 1993 Planned Program:
- (U) Complete effort started in FY 1991 to develop new ceramic fibers suitable for reinforcing CMCs for use above 2200°F.
- (U) Start to evaluate processing conditions for making turbine engine components from advanced IM MMCs.
- (U) Complete fabrication of a CMC divergent nozzle flap, jointly funded with PE #0602203F, for an FY 1994 F100 engine test.

(U) Work Performed By: The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages the project. 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.

(U) Related Activities:
- (U) Program Element #0602203F, Aerospace Propulsion.
- (U) Program Element #0603112F, Advanced Materials for Weapons Systems.
- (U) Program Element #0603202F, Aerospace Propulsion Subsystem Integration.
- (U) Program Element #0603216F, Aerospace Propulsion and Power Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

(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 1991 Accomplishments:
- (U) Developed an improved liquid lubricant tribological characterization method for additive assessment.
- (U) Continued transitioning MIL-C-87252, a new improved liquid coolant, into Air Force and Navy aircraft.

(U) FY 1992 Planned Program:
- (U) Develop tribological modelling effort to better understand the influence of materials properties on film stresses, friction, and wear in thin layered solid lubricant films.
- (U) Develop accurate models of laser ablation, plasma dynamics, and film formation and growth during pulsed laser deposition (PLD) of solid lubricant films to enable future low cost design of PLD coatings for special applications.

(U) FY 1993 Planned Program:
- (U) Synthesize 700°F engine oils (+300°F in capability) from previously developed fluids/additive technology base.
- (U) 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 Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages the project. The major contractors are: University of Dayton, Dayton, OH; Ultrasystems, Inc., Irvine, CA; Exfluor, Austin, TX; Hughes Aircraft, El Segundo, CA; and Phoenix Chemical Laboratory, Chicago, IL.

(U) Related Activities:
- (U) Program Element #0603202F, Aerospace Propulsion Subsystem Integration.
- (U) Program Element #0603112F, Advanced Materials for Weapons Systems.
- (U) Program Element #0603216F, Aerospace Propulsion and Power Technology.
- (U) Program Element #0708011F, Industrial Base Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

7. (U) Project 2422, Protective Coatings and Materials: Develops materials and protective concepts to increase the survivability of aircrews and vital components of aircraft, missile, and space systems in natural and threat environments. This project supports the joint DOD Advanced Technology Demonstrations for Global Surveillance and Communication.

(U) FY 1991 Accomplishments:
- (U) Evaluated bio-organic synthesis techniques to apply optical filters on large area optics to harden them.
- (U) Investigated materials for a laser radiation badge/dosimeter that is lighter and easier to use.

(U) FY 1992 Planned Program:
- (U) Complete band modelling efforts for non-linear optic (NLO) multiple quantum well materials for high response speed protective concepts.
- (U) Complete the materials development effort on materials for the laser radiation badge/dosimeter.
- (U) Start making prototype devices using bio-organic materials developed to protect against agile laser threats.
- (U) Demonstrate producibility of the most promising new infrared pigments for use in coatings formulation studies.

(U) FY 1993 Planned Program:
- (U) Continue developing novel molecular (NLO) materials for protective concepts against laser threats.
- (U) Continue developing bio-organic structural materials to optimize transparency properties for systems applications.
- (U) Start developing spectrally integrated aircraft coatings.
- (U) Initiate development of materials for embedded sensors integrated into surveillance satellites.

(U) Work Performed By: The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages the project. 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.

(U) Related Activities:
- (U) Program Element #0603112F, Advanced Materials for Weapons Systems.
- (U) Program Element #0603202F, Aerospace Propulsion Subsystem Integration.
- (U) Program Element #0603211F, Aerospace Structures.
- (U) Program Element #0603216F, Aerospace Propulsion and Power Technology.
- (U) Program Element #0708011F, Industrial Base Program.

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

8. (U) Project 2423, Electromagnetic Windows and Electronic Materials: Develops high payoff materials and processes for electronic, optical, and electro-optical devices and subsystems for use on Air Force aircraft, missiles, munitions, and space systems. Focuses on materials for compound semiconductors, nonlinear optics, superconductors, infrared windows, and erosion resistant coatings.

(U) FY 1991 Accomplishments:
- (U) Developed environmentally safe alternatives for chemicals required to produce gallium arsenide semiconductors/devices.
- (U) Demonstrated first U.S. capability to grow single crystals of zinc germanium phosphide for frequency conversion devices.

(U) FY 1992 Planned Program:
- (U) Develop a process to grow bulk single crystal silicon carbide semiconductor material for use up to 1100°F.
- (U) Develop buffer layers to reduce thermal expansion mismatch between erosion resistant diamond coatings and bulk infrared (IR) window materials to enhance window durability.

(U) FY 1993 Planned Program:
- (U) Complete metal-organic chemical vapor deposition process for mercury cadmium telluride for long wavelength IR detectors.
- (U) Complete initial efforts on growing thallium-based superconducting films and transition to IR detector applications.
- (U) Complete work on toughening IR materials/coatings and transition to large scale erosion resistant IR window effort.

(U) Work Performed By: The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages the project. Major contractors are: DuPont, Wilmington, DE; General Electric, Syracuse, NY; Hughes Santa Barbara Research Center, Goleta, CA; Raytheon, Lexington, MA; and Sanders, Nashua, NH.

(U) Related Activities:
(U) Program Element #0602204F, Aerospace Avionics.
(U) Program Element #0602702F, Command, Control, Communications & Intelligence.
(U) Program Element #0603112F, Advanced Materials for Weapons Systems.
(U) Program Element #0708011F, Industrial Base Program.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

9. (U) Project 4084, Strategic 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 above 5000°F. Develops processes to make these materials, as well as coatings to extend operational capability and penetrate enemy defense systems. Funding increase in FY 1993 is due to preliminary evaluation of proposed reentry materials concepts.

(U) FY 1991 Accomplishments:
- (U) Not Applicable.

(U) FY 1992 Planned Program:
- (U) Develop integrated nosetip/heatshield concepts to improve penetration of advanced RVs.
- (U) Complete developing improved signature reduction materials.
- (U) Develop improved materials and processes for ballistic RV nosetips and new materials for antenna windows, high temperature control surfaces and insulation, and shape predictable leading edges to meet high performance maneuvering reentry vehicle (MaRV) loads and accuracy requirements.

(U) FY 1993 Planned Program:
- (U) Complete the integrated nosetip/heatshield concepts.
- (U) Begin to develop advanced dielectric materials and improved coatings for improved signature control.
- (U) Evaluate promising MaRV materials approaches from the FY 1992 effort for uniform ablation, improved bend strength, and heat transmission properties.

(U) Work Performed By: The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages the project. 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.

(U) Related Activities:
(U) Program Element #0601101E, Defense Research Sciences.
(U) Program Element #0603311F, Advanced Strategic Missile Systems.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0602102F Budget Activity: #1 - Technology Base
PE Title: Materials

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 joining techniques that will survive exposure to hostile natural and threat environments.

(U) FY 1991 Accomplishmenrts:
- (U) Not Applicable.

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

(U) FY 1993 Planned Program:
- (U) Develop CCCs that will be dimensionally stable within 1/20th of the operating wavelength of a phased array antenna during its entire orbit; 20% lighter than current antenna structures, and have a 10 year operational lifetime.
- (U) Optimize/characterize inorganic spacecraft coatings with improved space stability and optical properties.
- (U) Develop novel lightweight packaging/interconnect materials that are thermally matched with gallium arsenide monolithic microwave circuits.
- (U) Develop higher purity gallium arsenide for high efficiency phased array antenna transmit/receive modules.

(U) Work Performed By: The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages the project. Contractor will be determined by competitive source selection.

(U) Related Activities:
(U) Program Element #0603401F, Advanced Spacecraft Technology.
(U) Program Element #0603428F, Space Subsystems Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 06FF Directorate Operations | 38,602 | 41,280 | 41,442 | Cont | TBD |
| 2401 Structures and Dynamics | 5,948 | 6,086 | 7,679 | Cont | TBD |
| 2402 Vehicle Equipment | 4,508 | 4,810 | 5,866 | Cont | TBD |
| 2403 Flight Control | 6,578 | 7,140 | 8,676 | Cont | TBD |
| 2404 Aeromechanics | 5,538 | 5,740 | 6,687 | Cont | TBD |
| 4165 Precision Strike | 0 | 0 | 3,578 | Cont | TBD |
| Total | 61,174 | 65,056 | 73,928 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This science and technology program develops the air vehicle technology base in aeromechanics, structures, flight control/cockpits, and vehicle subsystems to reduce the life cycle costs and improve the performance of existing and future air vehicles. These technology programs are the foundation for the air vehicle technologies that support the DoD Science and Technology major thrusts of technologies for affordability and all weather, day/night precision strike. Project 4165, entitled Precision Strike, is programmed to start in FY 1993 to focus on the aircraft/weapon interface for delivery of precision strike weapons.

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; 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 aircraft structures; investigates new structural concepts and design techniques which exploit new materials and fabrication processes to strengthen air vehicle structures while reducing weight and cost.

(U) FY 1991 Accomplishments:
- (U) Developed structural test methods for determining hypersonic vehicle life in severe acoustic/temperature environments.
- (U) Validated the Automated Structural Optimization System (ASTROS)

Program Element: #0602201F Budget Activity: #1-Technology Base
PE Title: Aerospace Flight Dynamics

preliminary design program which optimizes aircraft structure for minimum weight.
- (U) Completed work on vibration control of space structures and transitioned this technology area to Phillips Laboratory.
- (U) Assessed the durability of ultrahigh temperature structural composites subjected to severe thermomechanical loads.

(U) FY 1992 Planned Program:
- (U) Demonstrate aircraft fuel tank sealing concepts through a full-scale F-15 fatigue test.
- (U) Develop extreme temperature test methods to support design and analysis of hydrogen-actively-cooled hypersonic structures.
- (U) Develop load bearing airframe structure with smart-skin.
- (U) Assess ballistic/laser vulnerability of thermoplastics.
- (U) Develop damping technology to solve fatigue problems in operational aircraft (e.g. C-5, F-15).
- (U) Develop improved methods for measuring the dynamic response of aircraft structure to reduce sonic fatigue.
- (U) Develop structural concepts and design techniques which exploit new materials and fabrication processes to reduce structural weight and cost.

(U) FY 1993 Planned Program:
- (U) Investigate hypersonic vehicle structural design concepts.
- (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 advanced design and damping technology to prevent buffet damage on twin tail fighter aircraft (e.g. F-15, F-18).
- (U) Employ computational fluid dynamics (CFD) technology to predict pressure distribution and aircraft structural loads.
- (U) Demonstrate efficiency enhancements of the Automated Structural Optimization System (ASTROS) preliminary design program.

(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 Dynamics, Ft Worth, TX; Boeing, Wichita, KS; and 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 #0603269F, National Aero-Space Plane (NASP).
- (U) PE #0708026F, Producibility, Reliability, Availability, Maintainability (PRAM).

Program Element: #0602201F Budget Activity: #1-Technology Base
PE Title: Aerospace Flight Dynamics

(U) PE #0603224C, Survivable, Lethal, and Key Technologies.
(U) PE #0603112F, Advanced Materials for Weapon Systems.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2402, Vehicle Equipment: This project reduces subsystem and component life-cycle-cost, improves vehicle and crew member survival in operational environments, and improves subsystem performance for current and future flight vehicles.

(U) FY 1991 Accomplishments:
- (U) Demonstrated advanced aircraft internal chemical/biological protection system.
- (U) Devised autonomous cargo loading and unloading concepts.
- (U) Developed design methods for injection molded windshields.
- (U) Fabricated and evaluated self-sealing techniques for tires.
- (U) Determine technology development needs for improving aircraft subsystem component reliability.

(U) FY 1992 Planned Program:
- (U) Develop design concepts for integrating thermomanagement, flight control and other subsystems to improve reliability and performance.
- (U) Develop computational fluid dynamics (CFD) methods to model separation of crew escape modules from hypersonic vehicles.
- (U) Develop and evaluate longer life tires and associated analytical tools to reduce life cycle costs.
- (U) Perform initial demonstration of thermal management assessment tools for fighter aircraft.
- (U) Develop design/assessment methodology for increasing mechanical/electronic component life.

(U) FY 1993 Planned Program:
- (U) Build and test a full-scale injection molded canopy which doubles canopy service life and reduces cost tenfold.
- (U) Analyze failures of mechanical subsystems and components to establish better life prediction tools and reduce mishaps.
- (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) Complete simulation and modelling of the Halon replacement program for engine nacelle fire extinguishing.

(U) Work Performed By: This project is managed by the Flight Dynamics Directorate of Wright Laboratory, Wright-Patterson AFB, OH. The

Program Element: #0602201F Budget Activity: #1-Technology Base
PE Title: Aerospace Flight Dynamics

top five contractors are: General Dynamics, Ft Worth, TX; Garrett Corp, Torrence, CA; Canadian Commercial Corp, Ottawa, CN; McDonnell Douglas, St Louis, MO; and Computer Technology Assoc., 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 #0603231F, Crew Systems Technology.
(U) PE #0604212F, Aircraft Equipment Development.
(U) PE #0604609F, Reliability and Maintainability Technology Insertion Program (RAMTIP).
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 2403 , Flight Control: This project develops technology to: (a) enable the pilot to get the most performance from the aircraft under all conditions; (b) provide the pilot with the display of information from on-board subsystems and off-board intelligence sources for increased situational awareness leading to enhanced mission performance and flight safety; and (c) provide robust capability to control aircraft after damage and failures (control surfaces failed, cables severed, etc.).

(U) FY 1991 Accomplishments:
- (U) Completed the baseline design for an advanced transport cockpit.
- (U) Flight tested Ada fault-tolerant flight control system on A-7.
- (U) Developed methods for estimating stability & control of flight vehicles at high angles of attack or hypersonic speeds.

(U) FY 1992 Planned Program:
- (U) Complete simulation of three-dimensional stereo, pathway-in-the-sky flight display for pilot aiding.
- (U) Sensor test for a passive landing guidance system.
- (U) Perform real time, piloted simulator assessment of adaptable route planning capability for multi-crew aircraft.
- (U) Demonstrate capabilities of advanced control theory to increase agility and maneuverability of fighter aircraft.
- (U) Develop and bench test new flight control system concepts to expand aircraft turning performance beyond current limits.
- (U) Determine control requirements for low observable (highly maneuverable) fighters.
- (U) Test Digital Flight Control System (DFCS) vulnerability to high level microwave energy to develop design guides for future survivable control system.

Program Element: #0602201F Budget Activity: #1-Technology Base
PE Title: Aerospace Flight Dynamics

(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 maneuverable fighter aircraft.
- (U) Explore full integration of critical onboard systems to improve mission effectiveness and reliability.
- (U) Lab test new low cost control actuator design that has 80% fewer parts than current servoactuators.
- (U) Define crew station design issues associated with a manned hypersonic vehicle.

(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; and 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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. These technologies have potential to reduce cost; improve range and payload to yield enhanced global force projection; and improve maneuverability while reducing observability to help pilots "kill and survive."

(U) FY 1991 Accomplishments:
- (U) Developed improved computational method for rapid aerothermodynamic evaluation of hypersonic vehicles.
- (U) Built CFD tool for hypersonic airframe-propulsion integration which was used to develop NASP wind tunnel inlet model.
- (U) Developed innovative aerocontrol device for low observable aircraft.

Program Element: #0602201F Budget Activity: #1-Technology Base
PE Title: Aerospace Flight Dynamics

- (U) Completed CFD tool to enable rapid (days versus months) aerodynamic evaluation of aircraft.
- (U) Developed multi-phase CFD code for assessment of aircraft fire suppression systems.
- (U) Designed inlet boundary layer management schemes using unique approach to reduce signature.

(U) FY 1992 Planned Program:
- (U) Develop database of aircraft geometries to enable use of emerging CFD tools.
- (U) Reduce CFD computer time five-fold to improve prediction capabilities and cut weapon system development cost.
- (U) Complete design of novel transport configuration to enable air mobility.
- (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 maneuverability and enable design of tailless (i.e. LO) aircraft.

(U) FY 1993 Planned Program:
- (U) Investigate design concepts for efficient hydrocarbon-fueled hypersonic cruisers for global force projection.
- (U) Complete reacting gas database for CFD code validation.
- (U) Experimentally validate and certify (a first for DoD) an Euler CFD code to enable wide use for design applications.
- (U) Develop elements of "Interdisciplinary Inverse CFD" methods to enable direct, requirement-driven air vehicle design.
- (U) Complete configuration database for a supersonic, low observable, tailless aircraft.
- (U) Complete inlet boundary layer management database and design criteria to reduce signature.

(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; Northrop, Los Angeles, CA; General Dynamics, Ft 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

Program Element: #0602201F Budget Activity: #1-Technology Base
PE Title: Aerospace Flight Dynamics

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 4165, Precision Strike: This project develops interface and delivery vehicle technologies for survivable day/night adverse weather precision strike. Interface provides for pilot management of off-board inputs and on-board sensors for target detection, identification, designation and weapon delivery as well as handoff of target data to the weapon. Aircraft and weapon trajectories are optimized considering integrated ground-based simulation of off board systems, aircraft, sensors and weapons in the battle environment. This project is the Air Force contribution to the Joint DoD Advanced Technology Demonstrations for Precision Strike. Funding for this thrust new start project is $3.578M.

(U) FY 1991 Accomplishments: Not Applicable.

(U) FY 1992 Planned Program: Not Applicable.

(U) FY 1993 Planned Program:
- (U) Modify high fidelity man-in-the-loop flight simulation to host the integrated mission environment of precision strike.
- (U) Develop cost functions and trajectory algorithms combining delivery aircraft and weapon trajectories and considering accuracy, threat, target considerations, survivability, theater limitations and multiple target attack.
- (U) Develop flying qualities and display presentations to optimize pilot mission management.
- (U) Link existing seekers/sensors to support weapon and aircraft systems simulation, for simulation of precision strike.

(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 Dynamics, Ft Worth, TX; Boeing, Wichita, KS; and Lockheed, Los Angeles, CA.

(U) Related Activities:
(U) PE #0601101F, In-House Laboratory Independent Research.
(U) PE #0603205F, Flight Vehicle Technology.
(U) PE #0603245F, Advanced Flight Technology Integration.
(U) The specific projects have been coordinated and fully integrated with DARPA, Air Force, Army, and Navy plans to insure nonduplication and compatibility with the integrated demonstrations.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 06MD Armstrong Laboratory Operations | 30,015 | 29,194 | 31,704 | Cont | TBD |
| 2729 Nuclear, Biological and Chemical (NBC) Defense | 2,060 | 2,493 | 2,234 | Cont | TBD |
| 6302 Occupational & Environmental Toxic Hazards in AF Operations | 2,815 | 2,849 | 4,788 | Cont | TBD |
| 6770 Biotechnology Studies in Advanced Systems | 555 | 1,230 | 1,756 | Cont | TBD |
| 6893 Manned Weapon Systems Effectiveness | 1,170 | 1,250 | 1,414 | Cont | TBD |
| 7184 Man-Machine Integration Technology | 8,500 | 6,499 | 9,276 | Cont | TBD |
| 7231 Safety & Aircrew Effectiveness in Mechanical Force Environments | 2,600 | 3,021 | 3,758 | Cont | TBD |
| 7755 Aerospace Medicine | 697 | 700 | 1,000 | Cont | TBD |
| 7757 Radiation Hazards in Aerospace Operations | 4,232 | 3,770 | 6,192 | Cont | TBD |
| 7930 Advanced Crew Technology | 1,806 | 1,993 | 4,077 | Cont | TBD |
| Total | 54,450 | 52,999* | 66,199 | Cont | TBD |

* Congress added $10.0M in FY 92. OSD included on the recision list.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program focuses on human aspects of the man interface with weapons systems. Key thrust 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; (3) use our understanding of human factors to invent countermeasures effective against enemy weapon system operators; and (4) develop defense measures for air base operations. Payoffs from this research will improve combat effectiveness by expanding the parameters defining operationally safe performance limits. New starts for FY 1992 include: (1) developing modeling techniques for Air Force helicopter noise and incorporating it in NOISEMAP, a computer model which will identify noise levels around a base due to base operations to assist community planning activities; (2) developing a Flight Qualified Dual Role Oxygen Sensor to measure both oxygen concentration and the flow of breathing gas for improved aircrew breathing systems; and (3) Combined Acceleration Flight Simulator (CAFS) experiments to assess technologies critical to the construction/operation of a simulator capable of high agility flight. Additional funding was provided in FY 1993 to support DOD Science and Technology Thrusts. Significant additional funding was added for the Precision Strike Thrust and for the Environmental Quality Special Emphasis.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06MD, Armstrong Laboratory Operations: This project complements all other projects in this program element by providing for the management, support, and operation of the Aerospace Medicine, Crew Systems, and Occupational and Environmental Health Directorates of the Armstrong Laboratory. It provides for the pay and related costs of civilian physicians, scientists, engineers,

and support personnel; travel, transportation of equipment, rents, communications, utilities, laboratory supplies, unique equipment, and other related costs needed to conduct human systems technology research and exploratory development.

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. Employing computer simulation, this program couples validated intelligence information with USAF operational concepts and predicts toxic challenge levels to air bases. The goals of this project are to develop the technology required to address the Air Force-unique requirements in the functional areas of: operations analysis for NBC defense; individual/collective protection; detection, identification and warning; contamination control; and aircrew performance effects of NBC pretreatment or treatment drugs.

(U) FY 1991 Accomplishments:
- (U) Developed pressurized air distribution unit to connect tent air conditioners to Multi-Man Intermittent Cooling System (MICS) in support of operation Desert Storm.
- (U) Provided guidance to operation Desert Storm field commanders on effective work/rest cycles when using intermittent cooling for extended work periods in Southwest Asia.

(U) FY 1992 Planned Program:
- (U) Complete report and guidance for decontamination of large (cargo/transport) aircraft interiors.
- (U) Complete/terminate thermal research and concept development of chemical defense equipment; transfer effort to Army.
- (U) Add a capability for decision-aiding and field level real-time analysis to a computer modeling system for identifying chemical and biological weapon threats to Air Force personnel and facilities worldwide.

(U) FY 1993 Planned Program:
- (U) Develop design parameters for of Air Force specific individual protective equipment based on analysis of operational impact of possible chemical scenarios and previous thermal burden research.
- (U) Develop techniques for analysis/modeling of chemical scenarios, specifically including operational impact of new threats from Third World countries.
- (U) Define the process, data bases, and design challenge levels required in the front end analysis of future equipment development programs for chemical/biological defense.

(U) Work Performed By: In-house research and program management by Armstrong Laboratory, Brooks AFB, TX. Contractors are: Jaycor, San Diego, CA; Systems Research Laboratory, Dayton, OH; Krug International, Dayton, OH; Rothe Development Inc, San Antonio, TX; and Illinois Institute of Technology, Chicago, IL.

(U) Related Activities:
(U) Army is DoD lead for chemical/biological warfare (CBW) defense; this project addresses USAF-unique requirements.
(U) Coordination with the Armed Services Biomedical Research Evaluation and Management (ASBREM) program and a USAF position established with the U.S. Army Medical Research and Development Command, Ft. Detrick MD.
(U) PE #0602205F, Training/Simulation Technology.

Program Element: #0602202F Budget Activity: #1 - Technology Base
PE Title: Human Systems Technology

(U) PE #0603221F, Crew Systems and Personnel Protection Technology.
(U) PE #0604703F, Aeromedical/Chemical Defense Systems Development.
(U) PE #0604706F, Life Support Systems.
(U) PE #0604601F, CBW Defense Equipment.
(U) PE #0702986F, Clothing Development.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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. Assessment of human tolerance levels for Air Force chemicals, fuels, and materials is required to establish exposure criteria for engineering design of new systems as well as to perform trade-off analysis between weapon systems performance and occupational health and environmental support requirements. This project supports the DOD Special Emphasis on Environmental Quality.

(U) FY 1991 Accomplishments:
- (U) Evaluated potential toxicological hazards of candidate Halon training agent replacements using isolated cells in a test tube.
- (U) Developed a predictive model of measuring chromium absorption and perchloroethylene carcinogenesis.
- (U) Developed improved methods to estimate risk when several routes of exposure to toxic chemicals are possible.

(U) FY 1992 Planned Program:
- (U) Investigate metabolism and tissue toxicity of candidate Halon replacements.
- (U) Improve mathematical models of the distribution and actions of toxic compounds in the body by incorporating a mechanism for predicting cancer following exposure.

(U) FY 1993 Planned Program:
- (U) Improve methodologies for interspecies extrapolation of toxicological data.
- (U) Conduct toxicological risk assessments of high energy fuels.
- (U) Initiate evaluation of potential toxicological hazards associated with using candidate Halon replacements in operational fire control situations.

(U) Work Performed By: In-house research and program management by Armstrong Laboratory, Brooks AFB, TX. Contractors are: Mantech Environmental Technology Toxic Hazards Research Unit, Wright-Patterson AFB, OH; Technilube Products Co, Los Angeles, CA (SBIR); and Operational Technologies Corp, San Antonio, TX (SBIR).

(U) Related Activities:
(U) PE #0602720A, Environmental Quality Technology.
(U) PE #0602777A, Systems Health Hazard Prevention Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0602202F Budget Activity: #1 - Technology Base
PE Title: Human Systems Technology

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 in-house scientists supported by this program element. The goal is to ensure high quality, meaningful, coordinated, exploratory development efforts. This effort supports: (1) 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 1991 Accomplishments:
- (U) Supported technical advisory groups such as DOD Human Factors Engineering Technical Advisory Group.
- (U) Supported the postdoctoral program and added positions in high power microwave bioeffects and mathematical models of functional vision.

(U) FY 1992 Planned Program:
- (U) Continue support of the National Academy of Sciences and National Research Council's Commission on Behavioral and Social Sciences and Education.
- (U) Augment Research Initiative Program in areas of artificial intelligence for training, voice communications, and radiofrequency bioeffects.
- (U) Establish study group on high power microwaves.

(U) FY 1993 Planned Program:
- (U) Establish a study group on hypervelocity escape.
- (U) Fund a panel to study issues surrounding unmanned vehicle-operations projected to the year 2010.

(U) Work Performed By: Managed by Armstrong Laboratory, Brooks AFB, TX.

(U) Related Activities:
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 designs for visual camouflage, optical countermeasures, and techniques to defeat infrared and radar sensors. Countermeasure designs and techniques are developed and delivered to Tactical Air Command.

(U) FY 1991 Accomplishments:
- (U) Developed design for aircraft masking for Desert Shield aircraft parking areas using both solid color and patterned formats.
- (U) Developed and transitioned a guide which provides specification data on effect of display time delays on effectiveness of flight simulation.

Program Element: #0602202F Budget Activity: #1 - Technology Base
PE Title: Human Systems Technology

- (U) Developed spaceborne direct view optical system flown on shuttle.

(U) FY 1992 Planned Program:
- (U) Evaluate design of Camouflage, Concealment, and Deception (CC&D) techniques for fixed facilities (e.g., hangars).
- (U) Space to Earth Direct View Optical System will fly on Shuttle to evaluate ground force maneuver identification capability.

(U) FY 1993 Planned Program:
- (U) Test "Ideal" CC&D visual pattern.
- (U) Transfer Spaceborne Direct-View Optical System to Space Command for space observation mission.
- (U) Prepare visual function test device for flight on shuttle to investigate on-orbit changes to visual accommodation.

(U) Work Performed By: Managed by the Armstrong Laboratory, Brooks AFB, TX. 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 Technology.
(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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, and measure the changes in weapon effectiveness as a result of changes in man-machine coupling. This project supports the Air Force contribution to the Joint DoD Advanced Technology Demonstrations for Precision Strike.

(U) FY 1991 Accomplishments:
- (U) Developed Night Vision Goggle (NVG) resolution charts to aid aviator pre-flight adjustment of NVGs--over 300 shipped to Desert Storm.
- (U) Evaluated Agile Eye Helmet-Mounted Display for improved pilot situational and combat awareness.

(U) FY 1992 Planned Program:
- (U) Integrate visual and audio display technologies as precursor to Super Cockpit technology development for enhanced air-to-air and air-to-ground mission effectiveness.
- (U) Develop cockpit lighting standard compatible with C-17 Night Vision Syster to improve operator effectiveness.

Program Element: #0602202F Budget Activity: #1 - Technology Base
PE Title: Human Systems Technology

- (U) Use new subjective and physiology-based workload metrics to quantify mental workload of aircrew in C-17 during Operational Test and Evaluation.

(U) FY 1993 Planned Program:
- (U) Evaluate possible use of strategic force management simulation of command, control, communication and intelligence for strategic bomber/tanker force execution.
- (U) Develop three-dimensional database of human heads with accurate shape and volume measurements for reliable helmet and head-mounted equipment sizing and design.
- (U) Develop technologies to evaluate a weapon system operator's situational awareness to quantitatively evaluate crew system designs.
- (U) Begin development of a miniature color image source for helmet-mounted displays to improve man-machine interface in the precision strike role.

(U) Work Performed By: Managed by the Armstrong Laboratory, Brooks AFB, TX. 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 Technology.
(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) The specific projects have been coordinated and fully integrated with Army, Navy, Air Force and DARPA plans to insure nonduplication and compatibility with the integrated demonstrations.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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. This information is then used to develop safe, effective escape/ejection systems, acceleration protection/restraint devices, and to reduce vulnerability of the crew station. This project also develops data for operator-centered communications, jamming, and noise exposure criteria, as well as concepts for operator control of remote mechanical systems using telepresence techniques.

(U) FY 1991 Accomplishments:
- (U) Demonstrated supermaneuverability G-profile in order to assess potential physiologic and psychologic effects.
- (U) Field tested the Advanced Dynamic Anthropomorphic Manikin (ADAM) in ejection and parachute-drop programs.

(U) FY 1992 Planned Program:
- (U) Develop safe head/neck loading criteria for helmet-mounted equipment mass limits during ejection and acceleration.

Program Element: #0602202F Budget Activity: #1 - Technology Base
PE Title: Human Systems Technology

- (U) Demonstrate 3-D audio display technology in-flight; concept is expected to improve pilot situational awareness.
- (U) Develop haul-back (inertia reel) design criteria for improved aircrew restraint systems.
- (U) Complete a mathematical model of noise levels from takeoff ground roll of current inventory aircraft to reduce the environmental/community impact of Air Force operations.

(U) FY 1993 Planned Program:
- (U) Develop lightweight Active Noise Reduction earphones for improved communications and hearing protection.
- (U) Develop criteria for assessing crew/passenger vulnerability and expected incapacitation from live fire exposures.
- (U) Incorporate new jamming metric into communications effectiveness analysis and studies.
- (U) Complete field validation of military training route noise model.
- (U) Develop preliminary model of effects of local topography on propagation of aircraft noise near airbases.

(U) Work Performed By: Managed by Armstrong Laboratory, Brooks AFB, TX. The major contractors are: Systems Research Lab., Inc., Dayton, OH; Dyncorp, Albuquerque, NM; Sparta Inc., Lagunda Hills, CA; Simula Inc., Phoenix, AZ; Odetics, Inc., Anaheim, CA; Micro-Optics Technologies, Inc., Middleton, WI; and Bonneville Scientific, Inc., Salt Lake City, UT.

(U) Related Activities:
(U) PE #0603231F, Crew Systems and Personnel Protection Technology.
(U) PE #0603269F, National Aero-Space Plane.
(U) PE #0604703F, Aeromedical/Chemical Defense Systems Development.
(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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) 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 1991 Accomplishments:
- (U) Determined compatibility of contact lens use with new aircrew protective mask.

(U) FY 1992 Planned Program:
- (U) Evaluate properties of rigid gas permeable contact lenses to enhance aircrew performance at altitude.
- (U) Determine the cardiac disease state of Class of '56 West Point graduates as part of a long-term study to validate the predictive value of blood lipid testing in assessing cardiac disease in aircrew before symptoms occur.

Program Element: #0602202F Budget Activity: #1 - Technology Base
PE Title: Human Systems Technology

- (U) Evaluate cardiovascular responses to microgravity effects in conjunction with NASA.

(U) FY 1993 Planned Program:
- (U) Investigate echocardiography as a safe, non-invasive method to screen pilot candidates for structural heart defects.
- (U) Investigate use of ACE-inhibitors as treatment for hypertension in aerospace environment.

(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 Technology.
(U) PE #0604703F, Aeromedical/Chemical Defense Systems Development.
(U) PE #0604706F, Life Support System.
(U) PE #0604601F, CBW Defense Equipment.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 and applications of electromagnetic and ionizing radiation in aerospace operations. Research concerns safety; environmental impact; mission success and countermeasures in combat; and biologic effects of exposure to radiofrequency/microwave radiation, lasers, and ionizing radiation. Provides support to other DOD programs by using unique USAF resources to extend radiation applications, behavioral research, and operations analysis. This project supports the DOD Special Emphasis on Environmental Quality.

(U) FY 1991 Accomplishments:
- (U) Provided laser biological effects information to use in computer simulation network for force-on-force training.
- (U) Assessed safety and operational impacts of unique electromagnetic radiation (EMR) pulse propagation profiles.

(U) FY 1992 Planned Program:
- (U) Continue development of the scientific data base on biologic effects of directed energy (laser, microwave, and particle beam) for improved safety standards.
- (U) Distribute to Air Force bases worldwide a computer model to allow base personnel to assess local laser hazards.

(U) FY 1993 Planned Program:
- (U) Assess cancer risks of radiofrequency radiation.
- (U) Evaluate the human body's natural defenses to directed energy and determine methods to improve effectiveness.
- (U) Revise safety standards for ultra-short laser pulses.

(U) Work Performed By: Managed by 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.

Program Element: #0602202F Budget Activity: #1 - Technology Base
PE Title: Human Systems Technology

(U) Related Activities:
(U) PE #0603231F, Crew Systems and Personnel Protection Technology.
(U) PE #0604706F, Life Support Systems.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 brassboard protective systems and procedures are developed to improve crew performance in this challenging environment. Additional tasks involve the evaluation, cockpit integration, and man-rating of this life support equipment. This project supports the Air Force contribution to the Joint DoD Advanced Technology Demonstrations for Precision Strike.

(U) FY 1991 Accomplishments:
- (U) Evaluated Advanced Technology Anti-G Suit for transition to preplanned product improvement of the COMBAT EDGE ensemble.
- (U) Man-rated pressure breathing-compatible chemical defense respirator for G and altitude protection.

(U) FY 1992 Planned Program:
- (U) Develop sustained operations crew duty cycle recommendations and strategies to enhance crew performance.
- (U) Initiate female G-Tolerance studies--determine G endurance as functions of physical fitness and menstrual periodicity.
- (U) Assess efficacy of bright light stimulation to modify circadian hormone release and enhance performance at night.

(U) FY 1993 Planned Program:
- (U) Develop physiologic-based criteria for mask cavity pressure limits in positive pressure breathing for G systems following rapid decompression.
- (U) Develop physiological model to predict effects on physical capabilities and crew performance resulting from combined environmental and biological stressors.
- (U) Apply altitude decompression model to develop operational prebreathing schedules for reduced risk of the bends.
- (U) Develop acoustic orientation technology to enhance aircrew spatial awareness during combat operations.

(U) Work Performed By: Managed by the Armstrong Laboratory, Brooks AFB, TX. Contractors are: Krug International, San Antonio, TX; Systems Research Laboratory, Dayton, OH; Rothe Development Co., San Antonio, TX; Arthur D. Little, Cambridge, MA; MOOG, Inc, East Aurora, NY; and Southwest Research Institute, San Antonio, TX.

(U) Related Activities:
(U) PE #0603231F, Crew Systems and Personnel Protection Technology.
(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) The specific projects have been coordinated and fully integrated with Army, Navy, Air Force and DARPA plans to insure

nonduplication and compatibility with the integrated demonstrations.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 06PP Directorate Operations | 23,575 | 22,858 | 22,605 | Cont | TBD |
| 3012 Ramjet Technology | 4,984 | 5,368 | 6,167 | Cont | TBD |
| 3048 Fuels and Lubrication* | 9,552 | 11,520 | 8,988 | Cont | TBD |
| 3066 Turbine Engine Technology | 20,319 | 23,543 | 26,630 | Cont | TBD |
| 3145 Aerospace Power Technology | 6,028 | 6,874 | 8,030 | Cont | TBD |
| 4101 Space Power Technology | 0 | 0 | 2,000 | Cont | TBD |
| 4169 Global Surveillance and Communications | 0 | 0 | 11,000 | Cont | TBD |
| TOTAL | 64,458 | 70,163 | 85,420 | Cont | TBD |

* Funding reflects Congressional additions of $3M in both FY 1991 and FY 1992 for coal derived fuel research.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology (S&T) program element develops airbreathing propulsion and aerospace power technology. The prime areas of focus are turbine engines, ramjets, fuels and lubrications, and aerospace power. Anticipated technology advances in turbine engine propulsion and lubrication systems will increase engine performance, reduce specific fuel consumption, and lower cost of ownership. Ramjet propulsion technology will reduce the time to target for missiles and provide high Mach propulsion for aircraft. Fuels efforts will provide a 50% increased heat sink capability by 1997 and 500% increase by 2003 to absorb the dramatically increasing waste heat generated by advanced aircraft subsystems. Power systems will produce a 2X increase in energy-to-weight by 1995. Power conditioning, thermal management, and battery improvements will significantly enhance aircraft reliability and reduce weight. Project 4169, Global Surveillance and Communication begins in FY 1993. This project develops technologies for the Joint DOD Advanced Technology Demonstrations for Global Surveillance and Communications.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 06PP, Directorate Operations: Provides management and support for the Aero Propulsion and Power Directorate, Wright-Patterson AFB, OH. Includes pay and benefits for civilian personnel, travel, transportation, rentals, communications, utili-ties, and procurement of supplies and equipment.

Program Element: #0602203F Budget Activity: #1 - Technology Base
PE Title: Aerospace Propulsion

2. (U) Project 3012, Ramjet Technology: Develops advanced propulsion concepts and cycles including: ducted rocket ramjets and solid fuel ramjets for missile propulsion providing increased average velocity and lethality; and turboramjets, air turborockets (ATR), and hydrocarbon fueled supersonic combustion ramjets (scramjets) for hypersonic vehicles to support rapid strike capability from U.S.-based military operations.

(U) FY 1991 Accomplishments:
- (U) Completed solid boron fuel ramjet subscale combustor tests that provide liquid fuel performance in an all solid system.
- (U) Completed first phase of mission analysis and design for hydrocarbon supersonic combustion ramjet-cruise missile and airbreathing booster applications.
- (U) Studied design of turboramjet unique components for future rig testing under joint AF/NASA program.
- (U) Verified the feasibility of the ATR in an air-to-ground missile application.

(U) FY 1992 Planned Program:
- (U) Complete final design and fabricate hydrocarbon fuel heat exchanger/reactor sector to accommodate the increased combustion and skin friction temperatures at Mach 5-6.
- (U) Design/fabricate piloting and fuel injectors for Mach 6-8 hydrocarbon scramjet missile.
- (U) Conduct full scale, direct connect solid fuel ramjet tests to define combustion efficiency and engine performance limits at simulated flight conditions.
- (U) Select ATR solid fuel gas generator candidates. The ATR eliminates the need for a boost rocket in a ramjet missile (30% fuel reduction) and is only about 50% of the weight of an equivalent turbojet.

(U) FY 1993 Planned Program:
- (U) Fabricate turboramjet annular combustor and conduct fuel heat exchanger/reactor testing for AF/NASA Mach 5-6 applications.
- (U) Assemble and rig test a missile configured hydrocarbon scramjet at Mach 6-8 conditions demonstrating cruise and accelerator capability for time urgent targets.
- (U) Conduct solid fueled ATR rig test to demonstrate fuel com-bustion performance for low cost missile applications.
- (U) Complete full scale boron solid fuel ramjet rig tests and fabricate hardware to demonstrate integrated inlet/motor performance and a solid ramjet system with liquid fuel performance that maintains handling/storage characteristics of conventional solid rocket motors.

(U) Work Performed By: Both in-house and through contracts managed by personnel at the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractors are: Atlantic Research Corp, Gainesville, VA; General Electric Aircraft

Engine, Evendale, OH; Pratt & Whitney Aircraft, West Palm Beach, FL; Hughes Aircraft, Canoga Park, CA; Boeing Aerospace, Seattle, WA; Chemical Systems Division, San Jose, CA; and Hercules, McGregor, TX.

(U) Related Activities:
- (U) Program Element #0603216F, Aerospace Propulsion and Power Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3048, Fuels and Lubrication: Develops economical, thermally stable fuels derived from both petroleum and coal to accommodate the dramatically increasing heat generated by advanced aircraft subsystems. Develops cost-effective, higher temperature lubricants and more reliable lubrication systems for advanced, high temperature gas turbine engines.

(U) FY 1991 Accomplishments:
- (U) Demonstrated a second generation endothermic fuel concept and transitioned technology to an advanced development program.
- (U) Completed development of a 700°F load capacity test for evaluation of turbine engine lubricants.
- (U) Completed assessment of thermal stability characteristics of hydrocarbon compounds derived from coal.

(U) FY 1992 Planned Program:
- (U) Complete development of a powder lubricated hybrid ball bearing providing a 500-hour life capability.
- (U) Rig test candidate additives that will increase the temperature limit of JP-8 by 100°F (JP8+100) providing increased heat sink capability.
- (U) Develop diagnostic techniques to assess the thermal stability of high heat sink petroleum and coal derived fuels.
- (U) Evaluate JP-900 petroleum and coal derived fuel candidates to provide 500% increase in heat sink capability over JP-8.
- (U) Rig test lightweight propfan gearbox with increased output horsepower for demonstrator missile engines.
- (U) Demonstrate high speed bearing/seal technology with the capability for a 50% temperature and 25% speed increase.

(U) FY 1993 Planned Program:
- (U) Complete rig tests of JP8+100, prepare specifications, and initiate validation tests of JP8+100.
- (U) Develop endothermic catalysts to extend JP-900 and JP-10 heat sink capability to Mach 4-6 applications.
- (U) Demonstrate high speed, high temperature (1200°F) ceramic roller bearings for demonstrator missile engines.

Program Element: #0602203F Budget Activity: #1 - Technology Base
PE Title: Aerospace Propulsion

- (U) Develop counter-rotating intershaft seal for turbine engine demonstrator providing 25% higher speed at full life.
- (U) Rig test candidate high temperature, thermally stable avia-tion fuels derived from coal to ensure domestic availability.

(U) Work Performed By: Both in-house and through contracts managed by personnel at the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The four major contractors for this project are: General Electric, Evendale, OH; United Technologies, East Hartford, CT and West Palm Beach, FL; University of Dayton Research Institute, Dayton, OH; and Allied Signal, Energy and Materials Research Center, Chicago, IL.

(U) Related Activities:
- (U) Program Element #0603216F, Aerospace Propulsion and Power Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 3066, Turbine Engine Technology: Develops technology to increase propulsion system operational reliability, mission flexibility, and performance while reducing weight, fuel consumption, and cost of ownership. Both analytical and experimental efforts are conducted in fans and compressors, high temperature combustors, turbines, internal flow systems, controls, exhaust systems, and structural design.

(U) FY 1991 Accomplishments:
- (U) Completed all component technology demonstration commensurate with a 30% improvement in engine performance.
- (U) Validated the structural integrity of a metal matrix composite (MMC) rotor which will reduce component weight by 50% with no loss in reliability.
- (U) Engine demonstrated the first-ever lightweight composite fuel pump resulting in a 53% weight savings.

(U) FY 1992 Planned Program:
- (U) Demonstrate an enhanced flow compressor that will provide twice the flow range capability of current designs.
- (U) Test metal-matrix structural support rods concept which will yield a 40% component weight reduction.
- (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 multifunction exhaust nozzles.

Program Element: #0602203F Budget Activity: #1 - Technology Base
PE Title: Aerospace Propulsion

- (U) Conduct advanced turbine airfoil film cooling and heat transfer investigations for increased component durability and reduced life cycle costs.

(U) FY 1993 Planned Program:
- (U) Verify aerodynamic and heat transfer design of large engine turbines in the new in-house research facility.
- (U) Validate advanced silicon carbide electronics for engine light-off detection to enhance system reliability/durability.
- (U) Validate lightweight, high strength MMC rotor designed to increase durability and reduce life cycle costs.
- (U) Demonstrate concept feasibility of a high inlet/exit tempera-ture combustor for missiles with a 35-50% volume reduction.
- (U) Demonstrate revolutionary turbine blade cooling technology at 600°F above state-of-the-art while meeting current life, reliability, and manufacturability requirements.

(U) Work Performed By: Both in-house and through contracts managed by personnel at the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractors are: General Electric, Evendale, OH; Pratt & Whitney, West Palm Beach, FL and East Hartford, CT; Garrett Engine Division, Phoenix, AZ; Allison Gas Turbine, Indianapolis, IN; Williams International, Walled Lake, MI; and Teledyne CAE, Toledo, OH.

(U) Related Activities:
- (U) Program Element #0601102F, Defense Research Sciences.
- (U) Program Element #0602102F, Materials.
- (U) Program Element #0603211F, Aerospace Structures.
- (U) Program Element #0603216F, Aerospace Propulsion and Power Technology.
- (U) Program Element #0602122N, Aircraft Technology.
- (U) Program Element #0602234N, System Support Technology.
- (U) Program Element #0603210N, Aircraft Propulsion.
- (U) Program Element #0602110A, Aviation Technology.
- (U) Program Element #0603003A, Aviation Advanced Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 3145, Aerospace Power Technology: Develops technologies for batteries and aircraft power generation, conversion, and transmission systems. A major focus of this project is the More Electric Aircraft (MEA) initiative based on using electrical power to replace hydraulic and pneumatic power transfer functions and their costly logistics support. Improvements quantified for MEA versions of the F-16 and F/A-18 are: increased reliability (8-18%); improved maintainability (9-12%); reduced vulnerability (12-14%); and most importantly -- 690

aircraft with MEA technology can do the war mission of 750 conventional aircraft. The keys to this initiative are miniaturized, ultra-reliable electric generation, distribution, and utilization components.

(U) FY 1991 Accomplishments:
- (U) Successful operational flight test of an aircraft battery with a 5 year maintenance-free life potential.
- (U) Developed Auxiliary Power Unit (APU) components reducing logistics ground support equipment and deployment costs.

(U) FY 1992 Planned Program:
- (U) Complete testing of second generation, higher reliability, high speed/high power switch for the MEA initiative.
- (U) Design/build a bread board power controller enabling a 2X improvement in reliability and a 50% increase in power density.
- (U) Construct and test bread board radar power supply which will increase power density by 50%.

(U) FY 1993 Planned Program:
- (U) Demonstrate an electronics cooling system which will nearly double power density and reliability of power controllers.
- (U) Demonstrate a solid state power controller for electric actuators that will enable a 2X improvement in power density.
- (U) Demonstrate a 250KVA starter/generator providing a 3-5X improvement in reliability.

(U) Work Performed By: Both in-house and through contracts managed by personnel at the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractors for this project are: General Electric, Schenectady, NY; Boeing Aerospace, Seattle, WA; Eagle-Picher, Joplin, MO; Research Triangle Institute, Research Triangle Park, NC; and Loral EOS Inc, Pasadena, CA.

(U) Related Activities:
- (U) Program Element #0603216F, Aerospace Propulsion and Power Technology.
- (U) Program Element #0603401F, Advanced Spacecraft Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 4101, Space Power Technology: Develops power generation, storage, and conditioning technologies specifically for advanced space applications. FY 1993 work to be executed by Wright Laboratory with coordination by Phillips Laboratory.

Program Element: #0602203F Budget Activity: #1 - Technology Base
PE Title: Aerospace Propulsion

(U) FY 1991 Accomplishments:
- (U) None.

(U) FY 1992 Planned Program:
- (U) None.

(U) FY 1993 Planned Program:
- (U) Establish baseline power management/distribution and thermal management concepts for space-based surveillance systems.
- (U) Establish priority and begin development of critical power components for a space-based surveillance systems.

(U) Work Performed By: Both in-house and through contracts managed by personnel at the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. Contract awards in FY 1993.

(U) Related Activities:
(U) Program Element #0603216F, Aerospace Propulsion and Power Technology.
(U) Program Element #0603401F, Advanced Spacecraft Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

7. (U) Project 4169, Global Surveillance and Communications: This project addresses development of space power and conditioning technology for military communications (geosynchronous orbits) and surveillance platforms (mid/low earth orbits). The objective is to develop solar power source, battery energy storage, and power distribution bus which are compatible with multiple users. The key technology drivers are weight, cost, and life. This project develops technologies for the Joint DOD Advanced Technology Demonstrations for Global Surveillance and Communications.

(U) FY 1991 Accomplishments:
- (U) None.

(U) FY 1992 Planned Program:
- (U) None.

(U) FY 1993 Planned Program:
- (U) Perform trade study on arraycosts using conventional planar cells versus multiband gap cells.
- (U) Conduct design study of advanced nickle-hydrogen battery based on new electrode material, new electrolyte concentration, and novel separator material aimed at a 20% increase in energy density.
- (U) Develop waste heat rejection system design to improve energy density and efficiency of power conditioning units.

Program Element: #0602203F Budget Activity: #1 - Technology Base
PE Title: Aerospace Propulsion

- (U) Develop electrical components based on high temperature semiconductors to improve life of power conditioning units.

(U) Work Performed By: Both in-house and through contracts managed by personnel at the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractors are to be considered on a competitive basis.

(U) Related Activities:
- (U) Program Element #0603226E, Experimental Evaluation of Major Innovative Technologies.
- (U) Program Element #0603006A, $C^3$.
- (U) Program Element #0603726F, $C^3I$ Subsystems Technology.
- (U) Program Element #0602702F, $C^3$.
- (U) Program Element #0603401F, Advanced Spacecraft Technology.
- (U) Program Element #0602782A, $C^3$ Technology.
- (U) This project has been coordinated and fully integrated with the Army, Navy, Air Force, and DARPA plans to insure nonduplication and compatibility with the integrated demonstrations.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602204F
PE Title: Aerospace Avionics

Budget Activity: # 1 - Technology Base

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 06AA Laboratory Operations | 39,110 | 39,857 | 39,592 | Cont | TBD |
| 2000 Active Electronic Countermeasures | 2,826 | 3,327 | 3,437 | Cont | TBD |
| 2001 Electro Optical Technology | 2,122 | 2,498 | 2,581 | Cont | TBD |
| 2002 Microwave Technology | 4,381 | 5,157 | 5,325 | Cont | TBD |
| 2003 Avionics System Design Technology | 3,911 | 4,601 | 4,753 | Cont | TBD |
| 2004 Reconnaissance/Strike Electro-Optical Sensors | 1,394 | 1,636 | 1,695 | Cont | TBD |
| 4080 Ballistic Missile Avionics | 0 | 6,704 | 13,100 | Cont | TBD |
| 4166 Precision Strike* | 0 | 0 | 18,000 | Cont | TBD |
| 6095 Inertial Reference and Guidance Technology | 1,462 | 1,718 | 1,775 | Cont | TBD |
| 6096 Microelectronics Technology | 3,264 | 3,844 | 3,969 | Cont | TBD |
| 7622 Reconnaissance/Strike RF Sensors | 2,171 | 2,556 | 2,637 | Cont | TBD |
| 7629 Fire Control Avionics | 3,522 | 4,146 | 4,282 | Cont | TBD |
| 7633 Passive Electronic Countermeasures | 2,598 | 3,054 | 3,154 | Cont | TBD |
| 7662 Avionics Data Transmission and Reception | 986 | 1,159 | 1,197 | Cont | TBD |
| Total | 67,747 | 80,257 | 105,497 | Cont | TBD |

*This project supports the Joint DoD Advanced Technology Demonstration for Precision Strike.

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 navigation and guidance for air-vehicles and ballistic missiles. Advances in avionics will multiply weapon system effectiveness, enhance reliability, and reduce life cycle costs. This Program Element contains the Air Force's avionics portion of the Joint DOD Advanced Technology Demonstration for Precision Strike. Additional FY 1993 funding was added: $18 million to support DOD Science and Technology

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

thrust in Precision Strike and $6.4 million for Air Force Ballistic Missile Avionics technology to support advanced accelerometers.

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.

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 1991 Accomplishments:
- (U) Investigated new high temperature superconductivity technology for electronic combat applications.
- (U) Tested 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 the basis for new Digital 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 signature spectrum.
- (U) Demonstrate DRFM in chip configuration for application to missile countermeasures.
- (U) Develop advanced software algorithms to produce real-time spatial and temporal control of jamming energy.

(U) Work Performed By: The Wright Laboratory, Wright Patterson AFB OH, manages this project. The five major contractors are: Lockheed Sanders Corp, Nashua NH; Hughes Aircraft Co., El Segundo CA; ITT Corp., Nutley NJ; Harris Corp., Melbourne FL; and SRL Inc., Dayton OH.

(U) Related Activities:
(U) PE #63270F, Electronic Combat Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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 1991 Accomplishments:
- (U) Designed a Gallium Arsenide (GaAs)-based mid-infrared (IR) detector for better reliability and producibility of laser radar.
- (U) Continued monolithic diode array pump effort for efficient flyable solid state lasers.
- (U) Built first very high speed optical processing arrays to improve target identification capabilities.

(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 very high-speed integrated circuit (VHSIC)-based systems.

(U) FY 1993 Planned Program:
- (U) Transition diode pumping technology into laser applications.
- (U) Initiate advanced ultraviolet passive detectors effort for detection of missile plume in background clutter.
- (U) Apply opto-electronic integrated circuits (ICs) to pixel level image processing.

(U) Work Performed By: Wright Laboratory, Wright Patterson AFB OH, manages this project. Major contractors are: AT&T, Holmdel NJ; Westinghouse, Pittsburgh PA; Lockheed-Sanders, Nashua NH; Honeywell, Minneapolis MN; and Hughes Aircraft, El Segundo CA.

(U) Related Activities:
(U) PE #0603203F, Advanced Avionics for Aerospace Vehicles.
(U) PE #0603270F, Electronic Combat Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

4. (U) Project 2002, Microwave Technology: Develops radio frequency (RF) component technology for electronic combat, tactical airborne radar, and communications. Emphasizes increased performance, reliability, size, weight, and affordability. Research includes solid state and travelling wave tube (TWT) devices, monolithic integrated circuits (ICs), noise amplifiers, signal controls, transmit/receive (T/R) modules, and advanced antennae.

(U) FY 1991 Accomplishments:
- (U) Developed economical TWTs for electronic countermeasures (ECM) self protection jammers.
- (U) Developed microwave high electron mobility transistor (HEMT) low noise amplifiers for aircraft radars.
- (U) Built combined microwave/digital ICs for smaller airborne fire control receivers.
- (U) Built high performance space communication amplifiers at 44 GHz using Indium Phosphide transistors.

(U) FY 1992 Planned Program:
- (U) Complete development of new, high efficiency power amplifier technology for 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: Wright Laboratory, Wright Patterson AFB OH, manages this project. 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.

(U) Related Activities:
(U) PE #0602702F, Command/Control/Communication.
(U) PE #0603203F, Advanced Avionics for Aerospace Vehicles.
(U) PE #0603706E, Microwave/Millimeterwave Integrated Circuits.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: 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 1991 Accomplishments:
- (U) Constructed a neural network electronic warfare sensor resource manager to improve emitter identification capabilities of Radar Warning Receivers.
- (U) Studied design for computer testability to determine constraints for fault tolerant avionics architectures.
- (U) Completed 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 radar warning receiver (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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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 1991 Accomplishments:
- (U) Completed development of variable parameter testbed forward-looking infrared (FLIR) to improve testing of FLIR components.
- (U) Tested and evaluated the Army Standard Advanced IR Sensor (SAIRS) focal plane array for application to Air Force requirements.
- (U) Completed 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; TASC, Reading MA; and Amber Engineering, Goleta CA.

(U) Related Activities:
(U) PE #0603203A, Aerospace Avionics.
(U) PE #0603737F, Strategic Relocatable Target Detection.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

7. (U) Project 4080, Ballistic Missile Avionics: This is a new project to develop guidance technologies for intercontinental ballistic missiles (ICBMs). 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.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

(U) FY 1991 Accomplishments: (PE #0603311F)
- (U) Delivered 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) Develop high accuracy linear integrated circuits (ICs) for missile guidance applications.
- (U) Develop Gallium Arsenide (GaAs) Charge Injection Device (CID) to improve guidance signal readout capability.

(U) FY 1993 Planned Program:
- (U) Develop high accuracy digital accelerometers that improve weight and volume over stand-alone devices.
- (U) Investigate emerging solid state inertial component technologies to meet low cost high reliability intercontinental ballistic missile (ICBM) guidance requirements.
- (U) Evaluate GaAs charge injection device array for stellar update guidance application.
- (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 for improved autonomous navigation.
- (U) Increase in funding is do to development of the Thrust Axis Accelerometer ($3M) for integration into the Advanced Inertial Measurements System Advanced Technology Transition Demonstration (ATTD) during FY 1995 and investigation of new microinertial instrument technology ($3.4M) to provide options for integration into the High Performance Manuevering Reentry Vehicle ATTD during FY 1996 (PE 0603311F).

(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) PE #0603311F, Ballistic Missile Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International cooperative Agreements: Not Applicable.

8. (U) Project 4166, Precision Strike: This project develops the Strike Aircraft avionics technologies needed to achieve tightly coordinated hunter-killer operations for day/night/all-weather

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

precision strike of time critical, fixed and mobile targets. The focus of this effort is the weapon delivery aircraft - providing its contribution to operations involving internetted surveillance, air vehicle, and weapon assets. The strike aircraft will use target location and mission plan information transmitted to it in real-time from off-board surveillance sources, program its weapon(s) with appropriate targeting reference data, finalize its own target approach and threat avoidance strategy, and execute the weapon delivery. Emphasis will be given to adapting technologies developed by other projects (communications, navigation, automated mission management, targeting sensors, automatic target recognition, displays/controls, etc.) to reduce the target detection to weapon impact timeline to keep targeting handoff errors within the defined limits of precision strike. Examples of specific technology adaptations needed for functional integration and automation include: Global positioning System (GPS) to establish a common navigation and targeting grid for precise coordination of hunter-killer assets; automatic target recognition for faster screening of surveillance products; high speed data links for real-time exchange of targeting data and strike coordination; and high resolution sensors for final target designation and post strike assessment. Primary project outputs will include demonstrated feasibility of precision weapon delivery using real-time offboard targeting data, preliminary designs for affordable upgrades to existing strike aircraft systems, and recommendations for procedures and/or training which reduce system errors, crew work load, and mission timelines.

(U) FY 1991 Accomplishments:
- (U) None.

(U) FY 1992 Planned Program:
- (U) None.

(U) FY 1993 Planned Program:
- (U) Baseline weapon delivery performance to identify significant contributing factors to mission timelines and sources of error.
- (U) Define information flow and subsystem interface improvements for real-time internetting of surveillance, strike, and weapon delivery systems.
- (U) Design prototype aircraft subsystem upgrades to improve mission performance baselines.
- (U) Initiate planning for realistic weapon delivery demonstrations involving surveillance and strike assets of multiple services.

(U) Work Performed By: The Wright Laboratory, Wright Patterson AFB OH, manages this project. Industry team members will be chosen beginning in FY 1993.

(U) Related Activities:
(U) PE #0602201F, Aerospace Flight Dynamics.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

(U) PE #0602202F, Human System Technology.
(U) PE #0602602F, Conventional Munitions.
(U) PE #0602702F, Command, Control, Communication.
(U) PE #0603203F, Advanced Avionics for Aerospace Vehicles.
(U) PE #0603245F, Advanced Fighter Technology Integration.
(U) PE #0603601F, Conventional Weapons.
(U) This project has been coordinated and fully integrated with DARPA, Air Force, Army and Navy to ensure nonduplication and compatibility with the integrated demonstrations.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

9. (U) Project 6095, Inertial Reference and Guidance Technology: Improvements in the accuracy of inertial navigation systems and sensors for air vehicles will be needed to conduct precise strike and reconnaissance missions. This project will enhance both sensors and systems used for navigation. This project also attempts to lower radiating system aircraft installation cost by combining antennas of multiple functions to lower the total number of antennas needed to perform multiple missions.

(U) FY 1991 Accomplishments:
- (U) Fabricated and evaluated an inertial grade fiber optic gyro to reduce navigation system costs.
- (U) Completed plasma shock effects work for hypervelocity navigation.
- (U) Developed 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) Laboratory test embedded multifunction antenna technology for hypervelocity vehicles.
- (U) Demonstrate through simulation, concept of integrated inertial mission effective flight reference information.
- (U) Develop low cost Global Positioning System (GPS) antenna and low cost antenna electronics for null steering antenna.

(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

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

10. (U) Project 6096, Microelectronics Technology: Develops the defense related integrated circuit technology base to meet the performance, reliability, maintainability, and affordability requirements of future Air Force 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 1991 Accomplishments:
- (U) Demonstrated high speed, complex Gallium Arsenide (GaAs) memories for higher resolution radar and improved electronic warfare systems.
- (U) Fabricated resonant microbeam strain gauge for air data pressure sensor and demonstrated microbeam bare die testing.
- (U) Demonstrated first Indium Phosphide (InP) based P-HFET for complementary field effect transistor (FET) circuits for advanced radar electronic warfare (EW) and command, control, and communications (C3) subsystems.

(U) FY 1992 Planned Program:
- (U) Demonstrate high performance InP hybrid bipolar transistor (HBT) technology in 20GB/s multiplex (MUX) for next generation communications systems.
- (U) Demonstrate a new logic approach using resonant tunnelling transistors that will use 1/3 the number of devices per logic function for faster, more reliable digital processors.

(U) FY 1993 Planned Program:
- (U) Demonstrate an integrated differential pressure sensor with direct digital output suitable for air data applications.
- (U) Demonstrate automatic multi-component synthesis from very high speed integrated circuit (VHSIC) hardware description language (VHDL) description to trade-off device-packaging implementations.
- (U) Demonstrate high temperature, silicon carbide (SiC) integrated circuit operation at 350 degrees C.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

(U) Work Performed By: Wright Laboratory, Wright Patterson AFB OH, manages this project. Contractors are: AT&T, Murray Hill NJ; Rockwell, Thousand Oaks CA; Texas Instruments, Dallas TX; Honeywell, Minneapolis MN; and General Electric, Schenectady NY.

(U) Related Activities:
(U) PE #0602702F, Command, Control and Communications.
(U) PE #0603203F, Advanced Avionics for Aerospace Vehicles.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

11. (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 1991 Accomplishments:
- (U) With NASA, investigated Synthetic Aperture Radar (SAR) target signatures.
- (U) Investigated wide bandwidth adaptive waveform techniques for automatic detection of small mobile ground targets.

(U) FY 1992 Planned Program:
- (U) Perform bistatic experiment with Earth Resources Satellite as source for SAR 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 Air Force/NASA receiver experiments for high resolution bistatic imaging of surface targets.
- (U) Develop and test electronic counter-countermeasures (ECCM) algorithms to reduce Ultra High Resolution (UHR) SAR susceptibility to electronic countermeasures (ECM).

(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

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

12. (U) Project 7629, Fire Control Avionics: Sensors for future air-to-air and surface strike missions will 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 1991 Accomplishments:
- (U) Laboratory-tested multiple hypothesis tracking (MHT) to enhance search modes of tactical airborne radar, using high false alarm rate flight test data to validate enhanced target detection and tracking.
- (U) Demonstrated 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) Laboratory-test target cueing techniques to improve air-to-ground targeting for tactical strike aircraft.
- (U) Simulate real-time replanning system architecture for in-flight strike mission targeting changes.
- (U) Demonstrate neural network enhancement of future infrared and laser radar Model Based Vision (MBV) target recognizer training.
- (U) Develop Vector Neural Network (VNN) Signal Integration algorithm and other MHT techniques in ADA for real-time demonstration.

(U) FY 1993 Planned Program:
- (U) Perform real-time testing of advanced detection and tracking algorithms on next generation processor hardware, 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) Flight test experimental target cueing techniques against LANTIRN Pod requirements.

(U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB OH, manages this project. Contractors include: Coleman Research, Orlando FL; General Dynamics, San Diego CA; Litton, Van Nuys CA; Hughes, El Segundo CA; Sverdrup, Dayton OH; and Nichols Research, Dayton OH.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

(U) Related Activities:
(U) PE #0603203F, Advanced Avionics for Aerospace Vehicles.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

13. (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 1991 Accomplishments:
- (U) Enhanced the Rapid Scanning Superheterodyne Receiver (RSSR) to automatically identify spread spectrum radars.
- (U) Demonstrated fiber-optic based laser warning receiver.

(U) FY 1992 Planned Program:
- (U) Demonstrate precision angle of arrival antenna breadboard for radar warning receivers (RWR).
- (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.

(U) Work Performed By: The Wright Laboratory, 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) PE #0603270F, Electronic Combat Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

Program Element: #0602204F Budget Activity: #1 - Technology Base
PE Title: Aerospace Avionics

(U) International Cooperative Agreements: Not Applicable.

14. (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 1991 Accomplishments:
- (U) Demonstrated laser communications with holographic beam steering and an atomic filter for high signal to noise ratio.
- (U) Fabricated brassboard for jam resistant (JR) LPI transmission and reception of 16 KBPS data/voice.
- (U) Designed optical intraflight data link for short range communications during clandestine missions.

(U) FY 1992 Planned Program:
- (U) Demonstrate multiple beam multi-user optical communication.
- (U) Develop an LPI intraflight data link brassboard for cooperative engagements.
- (U) Demonstrate adaptive LPI/JR communication and transition to Navy advanced technology transition demonstration (ATTD) program for ARC-210 and Implementation into Integrated Communication Navigation Identification Avionics.

(U) FY 1993 Planned Program:
- (U) Initiate Integrated Radio Frequency/Optical communication study.
- (U) Demonstrate Air Force/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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 06HT Armstrong Laboratory Support | 11,589 | 10,538 | 12,020 | Cont | TBD |
| 1121 Training Development and Assessment Technology | 2,857 | 3,607 | 3,895 | Cont | TBD |
| 1123 Aircrew Training Technology | 8,512 | 8,185 | 8,911 | Cont | TBD |
| 1710 Logistics and Maintenance Technology | 2,938 | 3,917 | 4,676 | Cont | TBD |
| 3017 Command and Control Training | 766 | -0- | -0- | Cont | TBD |
| 7719 Force Acquisition & Distribution Systems | 3,058 | 3,469 | 3,275 | Cont | TBD |
| Total | 29,720 | 29,716 | 32,777 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: 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 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 and changes in the overall qualifications of the recruit pool pose challenges to the already demanding task of training Air Force 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 training.

(U) FY 1991 Accomplishments:
- (U) Determined the effectiveness of using neural networks to train and control intelligent tutors.
- (U) Developed guidelines for engineering, authoring, and selection of effective courseware for computer-based training.

(U) FY 1992 Planned Program:
- (U) Develop experimental training planning and evaluation technologies.
- (U) Develop procedures for defining fundamental job skill requirements.

Program Element: #0602205F Budget Activity: #1 - Technology Base
PE Title: Personnel, Training, and Simulation

- (U) Develop procedures for defining fundamental job skill requirements.
- (U) Apply hypermedia technologies to computer-based training authoring systems.
- (U) Investigate the instructional application of advanced human-machine interface technologies in intelligent tutoring systems.
- (U) Develop experimental training effectiveness and efficiency models.

(U) FY 1993 Planned Program:
- (U) Develop methods to identify core Air Force technical training needs.
- (U) Develop methods to integrate training planning and evaluation technologies into the instruction design process.
- (U) Develop preliminary diagnostic procedures for identifying fundamental skill deficiencies.
- (U) Apply advanced human-machine interface technologies to intelligent tutoring systems.
- (U) Develop instructional methodologies for a desktop logistics command and control trainer.
- (U) Initiate development of skill decay and transfer of learning models for training evaluation.

(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 Technology.
(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) The Air Force has formal agreements with Army and Navy to share development of computer-based training technologies.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 the value of training performed both on the ground and in the aircraft. 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 1991 Accomplishments:
- (U) Developed a model incorporating visual training effectiveness data to optimize simulator fidelity variables for aircrew training and mission rehearsal.
- (U) Incorporated the addition of an air component to long-distance simulator networking to demonstrate simulator interconnection for a joint maneuver training exercise.

Program Element: #0602205F Budget Activity: #1 - Technology Base
PE Title: Personnel, Training, and Simulation

(U) FY 1992 Planned Program:
- (U) Develop designs for visual system requirements and evaluation.
- (U) Complete C-130 Aircrew Training System Cost-Effectiveness Analysis.
- (U) Develop prototype of a color modeling workstation.
- (U) Evaluate expert systems for air combat maneuvering.
- (U) Demonstrate a debriefing system based on virtual-reality.

(U) FY 1993 Planned Program:
- (U) Develop total training system evaluation model.
- (U) Develop training system guidelines for formal school training.
- (U) Demonstrate a Joint-Service Air-to-Air network.
- (U) Develop expert system models for air combat maneuvering.

(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 Technology.
(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 Air Force 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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. Develops new technologies to improve logistics support to both combat and peacetime operations logistics support. 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 1991 Accomplishments:
- (U) Developed advanced models to predict the impact of operational scenarios on combat logistics requirements.
- (U) Developed and transitioned quick-response computer-based training system for PACAF command and control battle staffs. System used in Desert Storm.

(U) FY 1992 Planned Program:
- (U) Develop a database for the estimation of time required to perform certain maintenance tasks -- to be used for minimizing costs of manpower, personnel, and training (MPT) during the design process.

Program Element: #0602205F Budget Activity: #1 - Technology Base
PE Title: Personnel, Training, and Simulation

- (U) Develop a logistics simulation object database to improve information storage, retrieval, update, and display.
- (U) Develop human performance process models that replicate human behavior; models will enhance effective decision-making during conditions in which needed information is unavailable.

(U) FY 1993 Planned Program:
- (U) Develop logistics simulation model environment for use by logistics analysts at all component levels.
- (U) Develop operability test-bed that allows for a wide variety of human and hardware/software system combinations to be tested early in the design phase.
- (U) Develop a modeling tool to evaluate physical components, information flows, and human/machine activities in an information intensive, time critical system environment.

(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, McLean, 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 Development.
(U) PE 0602234N, Mission Support Technology: Human Factors Technology Area.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 man 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 problems. 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 1991 Accomplishments:
- (U) Developed an artificial intelligence-based embedded training program for Tactical Air Control Center training.
- (U) Developed 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) None.

(U) FY 1993 Planned Program:
- (U) None.

(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

Program Element: #0602205F Budget Activity: #1 - Technology Base
PE Title: Personnel, Training, and Simulation

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 Air Development Center to share C2 systems research products.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 1991 Planned Program:
- (U) Delivered pilot selection models to improve trainee quality.
- (U) Delivered pilot classification model to improve bomber/ fighter and tanker/transport classification decisions.

(U) FY 1992 Planned Program:
- (U) Develop a specialty structuring system model to conduct task level tradeoffs for different skills.
- (U) Begin model development of advanced transferability skills for manpower, personnel, and training application.
- (U) Deliver guidelines for optimizing decisions on personnel retraining decisions.
- (U) Deliver Processing and Classification of Enlistees-Person Job Match (PACE-PJM) System to Air Training Command for improved classification of trainees to jobs.

(U) FY 1993 Planned Program:
- (U) Deliver assignment-level person job match capability to Air Force Manpower Personnel Center for Air Force 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 Technology.
(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

Program Element: #0602205F Budget Activity: #1 - Technology Base
PE Title: Personnel, Training, and Simulation

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 1900 Environmental Quality Technology | 3,859 | 2,875 | 7,773 | Cont | TBD |
| 2673 Civil Engineering Technology | 3,041 | 3,758 | 4,000 | Cont | TBD |
| Total | 6,900 | 6,633 | 11,773 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology exploratory development program develops civil engineering and environmental technology for deploying, operating, and maintaining Air Force weapon systems. This goal is achieved in the following areas: construction of base facilities, utilities, and operating surfaces that protect 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 airbase site cleanup.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 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. Restoration technologies are also explored. In FY 1993, funds were added for increased research in environmental protection and damage mitigation.

(U) FY 1991 Accomplishments:
- (U) Investigated nitrogen oxide formation/control in jet engine test cells and environmental compliance to avoid shutdown.
- (U) Developed nontoxic corrosion inhibitors for primer coatings; eliminates hazardous waste generation during repainting.

(U) FY 1992 Planned Program:
- (U) Investigate atmospheric impacts of volatile organic chemicals from Air Force industrial operations.
- (U) Develop cryogenic removal technology to extract solid rocket propellant for disposal--reduce hazardous waste.
- (U) Develop control technologies for volatile organic chemical emissions from Air Force industrial operations.

(U) FY 1993 Planned Program:
- (U) Identify processes to treat combined waste streams for Air Force industrial complexes.

Program Element: #0602206F Budget Activity: #1 - Technology Base
PE Title: Civil Engineering & Environmental Quality

- (U) Develop environmentally safe techniques to destruct or recycle decommissioned solid rocket propellant.
- (U) Develop aircraft paint stripping technology using biodegradable materials.
- (U) Develop biological mechanisms for degrading nitroaromatic compounds in energetic materials, solvents, and plasticizers.
- (U) Develop and integrate fiber optic monitoring systems for identifying specific contamination and concentrations.
- (U) Investigate mechanisms that control metabolic pathways of bacteria used for biodegradation of hazardous waste.

(U) Work Performed By: The Air Force Civil Engineering Laboratory, Tyndall AFB FL manages this program. The major contractors are: EG&G, Idaho Falls ID; Martin Marietta, Oak Ridge TN; ASI, Albuquerque NM; General Atomics, San Diego CA; and Lockheed Missiles & Space, Palo Alto CA.

(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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; cost-effective maintenance and repair of air base facilities, utilities, and operating surfaces; and air base/aircraft crash rescue and fire suppression.

(U) FY 1991 Accomplishments:
- (U) Developed reliable, high temperature resistant pavement designs for short takeoff and landing aircraft.
- (U) Identified candidate Halon 1211 replacement agents and performed initial testing.
- (U) Determined pavement damage mechanisms caused by Auxiliary Power Units.
- (U) Completed the air base utility and energy needs assessment for all bases through the year 2000.

(U) FY 1992 Planned Program:
- (U) Investigate design concepts for reactive armor for hardened structures.
- (U) Define fire risks of new generation aircraft.
- (U) Define sensor system for automated airfield damage assessment.

(U) FY 1993 Planned Program:
- (U) Develop a facility solar energy conversion system concept.

Program Element: #0602206F Budget Activity: #1 - Technology Base
PE Title: Civil Engineering & Environmental Quality

- (U) Define pavement damage mechanisms caused by vectored jet engine thrust.
- (U) Develop next generation firefighting ensemble, designed to protect against hazardous materials and high temperatures.

(U) Work Performed By: The Air Force Civil Engineering Laboratory, Tyndall AFB FL manages this project. The major contractors are: New Mexico Engineering Research Institute, Albuquerque NM; Applied Research Associates, Albuquerque NM; EML Research, Hudson NH, Research Associates of Syracuse, Syracuse NY; and Harris Group, Reston, Va.

(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 Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 06RL Laboratory Operations | 14,200 | 14,796 | 15,418 | Cont | TBD |
| 2864 Space Vehicles Technology | 7,129 | 7,453 | 8,847 | Cont | TBD |
| 3058 Space Systems Propulsion Technology | 8,958 | 5,181 | 10,131 | Cont | TBD |
| 3059 Missile Systems Propulsion Technology | 6,919 | 5,470 | 7,764 | Cont | TBD |
| Total | 37,206 | 32,900* | 42,160 | Cont | TBD |

* This total reflects a Congressional reduction of $14,291.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology (S&T) 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 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. 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 Air Force program complements related S&T development conducted by the other Services and NASA.

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. 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 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 1991 Accomplishments:
- (U) Completed subscale testing of space structures to evaluate feasibility of active vibration control technique.
- (U) Demonstrated the feasibility of manufacturing lightweight composite payload shrouds with subscale hardware.
- (U) Conducted radiation testing of thin-film solar cells to determine feasibility for satellite use.
- (U) Demonstrated capability of multi-layer insulation system to reduce cryogen boil off for large scale storage tanks.
- (U) Conducted flight experiment of advanced liquid droplet radiator system.
- (U) Developed and demonstrated technique for filament winding of Isogrid Structures.
- (U) Completed assembly of the Advanced Space Structures Technology Research Experiment (ASTREX) test rig which provides a testbed for demonstration of advanced controls and structures technologies.

(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) Manufacture a lightweight composite payload shroud capable of providing major payload increases for Delta and Titan Class boosters.
- (U) Investigate technology and design options for a long-life cooling device capable of meeting long wave infrared sensor requirements.
- (U) Evaluate feasibility of solid state power device development using polymer technology with the potential of a 300% increase in energy density over current battery systems.
- (U) Identify and test thin-film solar cells for incorporation into a lightweight, advanced solar array.

(U) FY 1993 Planned Program:
- (U) Demonstrate embeddability of a piezo-ceramic sensors and actuators into advanced materials to show an increase in spacecraft structural damping of at least 2 orders of magnitude.
- (U) Develop composite spacecraft joining technologies to reduce weight by 50 percent over metallic joints.
- (U) Evaluate capability of composite materials to reduce weight and improve the heat dissipation rate of packaging and cooling systems for advanced electronics.

Program Element: #0602302F Budget Activity: #1 - Technology Base
PE Title: Rocket Propulsion and Astronautics Technology

- (U) Develop carbon-carbon heat pipe radiator design with potential to reduce spacecraft radiator weight by 30 percent.
- (U) Develop radiation-resistant, improved efficiency thin-film solar cells for incorporation into lightweight advanced array.

(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) Program Element 0602203F, Aerospace Propulsion.
- (U) Program Element 0603401F, Advanced Spacecraft Technology.
- (U) Program Element 0603402F, Space Test Program.
- (U) Program Element 0603428F, Space Subsystems Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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, solar/thermal propulsion systems, and high energy density materials technologies development.

(U) FY 1991 Accomplishments:
- (U) Determined feasibility of diamond film coatings to increase life of liquid engine turbopump bearings.
- (U) Successful qualification, integration, and launch of an advanced liquid feed system experiment.
- (U) Demonstrated high area ratio nozzle performance for the modular storable engine of simulated altitude.
- (U) Demonstrated operation of the first solar/thermal rocket for space application.
- (U) Demonstrated the "world's first" Lithium atom matrix in solid hydrogen, showing potential to double rocket payload capability.

(U) FY 1992 Planned Program:
- (U) Evaluate feasibility of liquid crystal polymers to increase performance and reliability of liquid engine nozzles.

Program Element: #0602302F Budget Activity: #1 - Technology Base
PE Title: Rocket Propulsion and Astronautics Technology

- (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) Determine feasibility for demonstrating 10-fold increase in combustion chamber durability for space launch propulsion.
- (U) Initiate development of capability to predict and mitigate liquid rocket combustion instability in space launch systems.
- (U) Complete feasibility testing of lightweight, composite turbopump components for space launch systems.

(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) Program Element 0603302F, Space and Missile Rocket Propulsion.
(U) Program Element 0603401F, Advanced Spacecraft Technology.
(U) Program Element 0603402F, Space Test Program.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 space boosters and strategic missile systems. This technology includes environmentally acceptable propellants, low cost rocket motor components, and low-cost processing for future space boosters and Intercontinental Ballistic Missiles (ICBMs). This technology enables new warfighting capabilities, enhances weapon system survivability and operational flexibility, and reduces life-cycle costs of fielded weapons.

(U) FY 1991 Accomplishments:
- (U) Demonstrated use of specimens to simulate damage effects on full scale composite cases for air launched missiles.
- (U) Demonstrated liquid crystal polymers on small rocket cases and nozzle components.
- (U) Successfully static tested a revolutionary solution propellant in an 800 lb solid rocket motor. When fully developed this

Program Element: #0602302F Budget Activity: #1 - Technology Base
PE Title: Rocket Propulsion and Astronautics Technology

environmentally clean propellant could lower the propellant cost by 50 percent.
- (U) Determined availability of computer tomography non-destructive evaluation technique to predict service life of missiles.

(U) FY 1992 Planned Program:
- (U) Identify and characterize environmentally acceptable 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 significant increase in rocket motor performance.
- (U) Identify environmentally acceptable propellants suitable for the remanufacture of Minuteman Stages 1,2, and 3.

(U) FY 1993 Planned Program:
- (U) Complete research leading to military reuse of ammonium perchlorate eliminating need for hazardous waste disposal.
- (U) Analyze and test five new polymers for use in lightweight missile skirts and fairings for ballistic missiles.
- (U) Complete research on clean propellants (<1% HCl in the exhaust) for space boosters.
- (U) Complete the feasibility investigation of an innovative processing technology which reduces the rocket motor processing steps from 23 to 9.

(U) Work Performed By: This program 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) Program Element 0602111N, Anti-Air/Anti-Surface Warfare.
- (U) Program Element 0602303A, Missile Technology.
- (U) Program Element 0602602F, Conventional Munitions.
- (U) Program Element 0603302F, Space and Missile Rocket Propulsion.
- (U) Program Element 0603311F, Ballistic Missile Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|---|
| 06WL | Lab Operations | 19,858 | 22,106 | 23,895 | Cont | TBD |
| 2218 | Directed Energy Weapon Technology Assessment | 1,813 | 1,904 | 2,374 | Cont | TBD |
| 3326 | Lasers and Imaging | 6,650 | 6,229 | 8,117 | Cont | TBD |
| 5797 | High Power Technologies | 6,387 | 6,229 | 7,516 | Cont | TBD |
| 8809 | Radiation Survivability & Hardness Technology | 967 | 1,000 | 1,591 | Cont | TBD |
| Total | | 35,675 | 37,468 | 43,493 | 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) devices, and accelerated plasmas and the phenomenologies and effects associated with these technologies. Also pursued are advanced optical technologies such as active and passive techniques for high resolution space object imaging and nonlinear optics (NLO) devices. This project also develops radiation hardening technologies applicable to Air Force systems. 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 are 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.

2. (U) Project 2218, Directed Energy Weapon (DEW) Technology Assessment: This project assesses vulnerability of US strategic and tactical systems to DEWs, technology assessment of DEWs for specific Air Force missions, and DEW lethality assessments against foreign targets. Calculations to resolve technical issues related to DEW sources, optical trains, propagation phenomena, and target response are developed and validated. This project also conducts

critical component and subsystem evaluation to maintain the Air Force laser vulnerability data base which supports all vulnerability assessments.

(U) FY 1991 Accomplishments:
- (U) Performed lethality/performance assessments for laser technologies in both tactical and antisatellite (ASAT) missions.
- (U) Updated laser lethality calculations to include detailed modeling of acquisition, tracking, and pointing functions.
- (U) Evaluated tactical HPM and laser technology transition opportunities (coordinated effort with other services and national laboratories).
- (U) Performed HPM susceptibility analyses on tactical systems.
- (U) Delivered simulated imagery for analysis at AF Space Command.
- (U) Published first formal vulnerability assessment by the in-house Satellite Assessment Center.

(U) FY 1992 Planned Program:
- (U) Upgrade and integrate atmospheric compensation, fire control and damage assessment models into satellite lethality calculations for realistic evaluations of ground based laser (GBL) ASAT technology options.
- (U) Investigate low to high power laser technologies 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 models for technology assessment.
- (U) Assess feasibility of HPM technologies for selected tactical applications.

(U) FY 1993 Planned Program:
- (U) Develop models for the response of potential tactical infrared missile threats to various HPM technologies.
- (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) Consolidate laser vulnerability data base for potential third world threats.
- (U) Update Air Force DEW propagation codes with improved models.

(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, Albuquerque, NM; Bell Systems Engineering Division, Albuquerque, NM; and Orion International Technology, Inc, Albuquerque, NM.

Program Element: #0602601F Budget Activity: #1-Technology Base
PE Title: Advanced Weapons

(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 moderate to high power lasers, associated optical systems, and long range optical imaging concepts for AF mission requirements. This includes advanced short wavelength laser devices for applications such as illuminators/imaging sources; advanced optical imaging techniques for target identification/assessment as well as aimpoint selection, maintenance, and damage assessment; optical component technology; and nonlinear optics (NLO) processes and techniques. Recently the emphasis in this project on long range optical imaging has significantly increased.

(U) FY 1991 Accomplishments:
- (U) Demonstrated holographic passive imaging of satellites from a field telescope.
- (U) Demonstrated a small-scale, portable chemical oxygen-iodine laser, with most of the hardware fabricated from plastic.
- (U) Demonstrated, in the field, compensation for atmospheric turbulence using non-mechanical NLO process.
- (U) Completed lab demonstration of the feasibility of fiber optically coupling of two widely separated imaging systems - key technology for passive imagery of geosynchronous satellites.

(U) FY 1992 Planned Program:
- (U) Evaluate high energy laser optical mirror coatings in a realistic environment.
- (U) Develop concepts for imaging geosynchronous and dim satellites.
- (U) Demonstrate the concept for advanced image enhancement, using NLO, with application to space object identification and space optical systems.
- (U) Complete development of smaller advanced oxygen generators for chemical laser applications.
- (U) Optimize image recovery software for imaging satellites from large telescopes.
- (U) Demonstrate 50 Watt sodium wavelength laser device for atmospheric compensation measurements.

Program Element: #0602601F Budget Activity: #1-Technology Base
PE Title: Advanced Weapons

(U) FY 1993 Planned Program:
- (U) Complete development of a fast algorithm for passive imaging of uncooperative space objects.
- (U) Demonstrate NLO techniques for non-mechanical shifting of laser wavelengths to the mid-infrared.
- (U) Demonstrate compensation of aberrated images from a high resolution phased array optical telescope.
- (U) Demonstrate advanced 150 Watt secondary laser device, with NLO elements, which will be used to significantly improve the atmospheric compensation of the primary laser/optical beam.

(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, 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 5797, High Power Technologies: This project explores nonconventional weapon 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 1991 Accomplishments:
- (U) Developed initial HPM phased array device technology.
- (U) Evaluated disruption capability of HPM on subsystems such as F-16 Digital Flight Control System, Air Launched Cruise Missile altimeter, and electro-explosive devices.
- (U) Formed and accelerated compact plasma toroids with energies up to 0.4 megajoules.
- (U) Developed a high power, long pulse, tunable HPM source.

(U) FY 1992 Planned Program:
- (U) Complete HPM model development and continue analysis to determine the potential for weaponization.
- (U) Accelerate compact plasma toroids up to 1.5 megajoules.
- (U) Develop a pulser and cathode components for an HPM array

capable of producing 1 kilojoule pulsed energy at many pulses per second.
- (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 effects codes on US and foreign systems to allow reliable predictions for untestable systems for technology assessments.
- (U) Demonstrate high power in x-band wavelengths using a backward wave oscillator to characterize target vulnerabilities.
- (U) Develop a high repetition rate wideband HPM test source using advanced switch and antenna technology.
- (U) Conduct analysis of semiconductor damage phenomenology and develop electromagnetic coupling codes to support hardening.

(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; and Science and Engineering Associates, Albuquerque, NM.

(U) Related Activities:
- (U) PE 0602120A, Electronic Survivability & Fuzing Technology.
- (U) PE 0602111N, Anti Air Warfare, Anti Surface Warfare Technology.
- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603605F, Advanced Weapons Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 8809, Radiation Survivability & Hardness Technology: This project develops survivability/vulnerability technology. This includes design analysis, systems response modeling, and methods for enhancing the survivability of electrical and optical components against a wide range of natural and hostile (non-laser) environments. Techniques will be developed to harden electronics against radiation effects such as those in a space or nuclear environment. This project provides the technology base for satellite survivability assessments through the development of potential failure models and computer simulations of multiple threat environments.

Program Element: #0602601F Budget Activity: #1-Technology Base
PE Title: Advanced Weapons

(U) FY 1991 Accomplishments:
- (U) Completed space radiation evaluation on fiber optic sample.
- (U) Completed study of radiation hardness of cryogenic circuits.
- (U) Completed weapon output studies on Soviet missiles.
- (U) Completed nuclear effects analysis for selected US space systems.

(U) FY 1992 Planned Program:
- (U) Validate advanced nuclear weapon models to determine prompt radiation at high altitudes for space systems.
- (U) Evaluate high temperature superconductors for space.
- (U) Study the applicability of special transistors for radiation hardened circuits.
- (U) Identify/develop required materials data base for computer models of damage mechanisms.

(U) FY 1993 Planned Program:
- (U) Implement multi-burst nuclear phenomenology computer code.
- (U) Complete protection studies for space system components.
- (U) Characterize nuclear and space debris effects on composite materials and other selected materials and space systems.
- (U) Complete test and analysis of three dimensional wafer scale central processing unit.
- (U) Complete radiation evaluation of non-volatile memories and optical components.

(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602602F Budget Activity: #1 - Technology Base
PE Title: Conventional Munitions

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 06AL Armament Directorate Operations | 17,446 | 15,119 | 15,782 | Cont | TBD |
| 2068 Advanced Guidance Technology | 10,444 | 11,439 | 9,931 | Cont | TBD |
| 2502 Ordnance Technology | 9,171 | 7,601 | 7,500 | Cont | TBD |
| 2543 Weapons Effectiveness Methodology | 1,554 | 1,701 | 1,698 | Cont | TBD |
| 2567 Aeromechanics Technology | 6,644 | 6,554 | 6,310 | Cont | TBD |
| 4167 Precision Strike | 0 | 0 | 26,186 | Cont | TBD |
| TOTAL | 45,259 | 42,414 | 67,407 | 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; and (6) modeling, technical assessments, and evaluation criteria for all efforts. Project 4167, *Precision Strike* begins in FY 1993. This project develops technology for the Joint DoD Advanced Technology Demonstrations for Precision Strike. This project will develop guidance technologies for adverse-weather precision strike. This program element 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 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 guidance technologies for air-launched conventional weapons. It also develops advanced instrumentation to test conventional weapons. Project payoffs include: adverse-weather and "launch and leave" guidance capability; increased accuracy; increased number of kills per sortie; increased aircraft survivability; and improved reliability and affordability.

(U) FY 1991 Accomplishments:
- (U) Completed analysis of infrared/radio frequency (IR/RF) dome concepts for multi-spectral, high Mach performance.
- (U) Completed formulation of Image Algebra and high signal to noise ratio optical processing filters for automatic target recognition algorithm development.
- (U) Initiated development of a low cost diode pumped solid state laser radar suitable for missile or submunition applications.

Program Element: #0602602F Budget Activity: #1 - Technology Base
PE Title: Conventional Munitions

- (U) Completed breadboard development and flight demonstration of Time-Space-Position-Information (TSPI) Data Processor.

(U) FY 1992 Planned Program:
- (U) Fabricate breadboard optical pattern recognition system.
- (U) Conduct tower and flight tests of diode pumped solid state laser radar system to determine guidance accuracy.
- (U) Initiate in-house development of an advanced computer architecture for target acquisition using Image Algebra.
- (U) Initiate in-house Multipulse Holography development program to enhance analysis of warhead fragmentation.
- (U) Complete brassboard development and ground test of Subminiature Telemetry System for test range support and Seek Eagle testing.
- (U) Complete a full spectrum and a 3-D RF statistical target model for multi-spectral seeker.

(U) FY 1993 Planned Program:
- (U) Initiate an autonomous air-to-surface seeker algorithm development that utilizes optical processing.
- (U) Integrate optical processing and laser radar systems into tactical missile configurations.
- (U) Initiate wideband radar development to define requirements for advanced guidance seeker research.
- (U) Initiate Weapon Attitude Measurement system development to support Seek Eagle Compatibility testing.
- (U) Integrate TSPI data processor at Eglin AFB test range, demonstrate through flight tests, and evaluate performance.
- (U) Demonstrate flight qualification testing of Subminiature Telemetry System at Eglin AFB test range.

(U) Work Performed By: This project is managed by Wright Laboratory's Armament Directorate, Eglin AFB FL. Major contractors are: Harris Corp, Melbourne FL; Raytheon Co, Bedford MA; Loral, Akron OH; Electro Systems International, Kennesaw GA; and Texas Instruments, Dallas TX.

(U) Related Activities:
(U) PE 0603601F, Conventional Weapons Technology.
(U) PE 0602303A, Missile Technology.
(U) PE 0604314F, Advanced Medium Range Air-to-Air Missile.
(U) PE 0604258N, Vector Scoring.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(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 payoffs include: improved munitions storage capability and transportation safety; increased warhead effectiveness against buried, hardened, and low visibility targets; improved submunition dispensing; and selectable multi-mode kill capability.

(U) FY 1991 Accomplishments:
- (U) Completed development of hydrocode used to analyze bomb designs. Used hydrocode to analyze GBU-28/B penetrating bomb used during Operation Desert Storm.

Program Element: #0602602F Budget Activity: #1 - Technology Base
PE Title: Conventional Munitions

- (U) Completed preliminary development of the GBU-28/B.
- (U) Demonstrated magnetically coupled slapper explosives initiation.
- (U) Tested anti-armor and insensitive munition fuze performance during final target interaction and warhead function.
- (U) Identified high performance insensitive high explosive (IHE) candidates.

(U) FY 1992 Planned Program:
- (U) Complete development of high performance IHE and transition to PE 0603601F.
- (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) Develop alternate fuze power sources using high energy density capacitor technology.

(U) FY 1993 Planned Program:
- (U) Begin design of an IHE initiation system.
- (U) Continue adaptive anti-armor fuze breadboard design.
- (U) Evaluate real-time hard target discrimination for optimum burst point of penetrating weapons.
- (U) Complete demonstration of dual-mode, low observable TDD.
- (U) Develop neural network algorithms for hard target penetrating weapons.
- (U) Develop warheads to defeat lethal agent production facilities and stockpiles with minimum collateral damage.

(U) Work Performed By: This project is managed by Wright Laboratory's Armament Directorate, Eglin AFB FL. The major contractors are: Martin Marietta, Orlando FL; Honeywell, Hopkins MN; Diversified Engineering Inc, Richmond VA; Motorola Inc, Scottsdale AZ; and KDI Precision Products, Cincinnati OH.

(U) Related Activities:
- (U) PE 0603601F, Conventional Weapons Technology.
- (U) PE 0604314F, Advanced Medium Range Air-to-Air Missile.
- (U) PE 0604602F, Armament/Ordnance Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 planned air-to-surface conventional weapons technology programs and assesses the vulnerability to those technologies. The payoffs include improved technology planning and increased technology focus.

(U) FY 1991 Accomplishments:
- (U) Evaluated fixed target response (breaching and concrete structural damage) to cased-charge blast/fragments.
- (U) Developed a new air-to-surface effectiveness code to evaluate new munition concepts.
- (U) Evaluated the effect of smart fuzing and improved guidance on lethality of new munition concepts.

Program Element: #0602602F Budget Activity: #1 - Technology Base
PE Title: Conventional Munitions

(U) FY 1992 Planned Program:
- (U) Test and evaluate fixed target response and component damage to internal blast and validate munitions effectiveness code.
- (U) Evaluate new kill mechanisms for ground threats.

(U) FY 1993 Planned Program:
- (U) Evaluate new air-to-surface concepts and use effectiveness software to support weapon design.
- (U) Complete concrete blast characterizations.

(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 LTV Aerospace and Defense, Dallas TX.

(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 2567, Aeromechanics Technology: This project develops technology to improve the aerodynamic efficiency of conventional weapons. These technologies improve aircraft performance by reducing weapon drag, enabling supersonic low-altitude weapon release, and thus increasing aircraft survivability.

(U) FY 1991 Accomplishments:
- (U) Completed fabrication and initiated flight qualification of lightweight composite air-to-air missile airframe.
- (U) Continued development of low cost/high reliability tri-service miniature ring laser gyro Inertial Measurement Unit (IMU).
- (U) Developed and validated computational fluid dynamics (CFD) codes for predicting weapon separations in the Mach 5 to Mach 10 region.
- (U) Validated CFD code to characterize transonic and supersonic separation of air-to-air missiles from aircraft weapon bays.
- (U) Designed synergistic adaptive electronic countermeasure filter/antenna for Global Positioning System for tactical weapons.

(U) FY 1992 Planned Program:
- (U) Complete flight test simulations of all composite air-to-air missile airframes using modern control bank-to-turn steering.
- (U) Begin effort to evaluate reaction control systems for very high speed, high maneuverable, compact air-to-air missiles.
- (U) Develop CFD analyses of submunition deployment from a hypersonic carrier vehicle.
- (U) Initiate study to integrate current and advanced weapons and launchers with the advanced combat aircraft using low drag, low signature, external conformal carriage.

Program Element: #0602602F Budget Activity: #1 - Technology Base
PE Title: Conventional Munitions

- (U) Initiate development of computation electromagnetic simulation to predict signature of low observable weapons with radar absorbing materials.
- (U) Continue development of low cost, highly reliable miniature tri-Service ring laser gyro IMU.
- (U) Begin development of low cost IMUs using fiber optics.
- (U) Initiate development of antijam, miniature, tactical weapon guidance system consisting of small conformal global positioning system receiver coupled with a very low cost IMU.

(U) FY 1993 Planned Program:
- (U) Initiate an in-house study of aerodynamic, structural, and integration technologies for hypersonic tactical missiles.
- (U) Develop CFD modeling techniques for non-linear aeroelastic phenomena in the transonic regime.
- (U) Complete development and validation of computation electromagnetic simulation.
- (U) Develop and analyze parallel processing architecture for guidance/navigation/control applications.

(U) Work Performed By: This project is managed by Wright Laboratory's Armament Directorate, Eglin AFB FL. The major contractors are: McDonnell-Douglas, St Louis MO; Rockwell Missile Systems Division, Duluth GA; Ford Aerospace, Newport Beach CA; and Honeywell, Minneapolis MN.

(U) Related Activities:
(U) PE 0603230F, Advanced Tactical Fighter.
(U) PE 0603601F, Conventional Weapons Technology.
(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 4167, Precision Strike: This is a new project beginning in FY 1993. This project develops technologies for the Joint DoD Advanced Technology Demonstration for Precision Strike. This project develops technologies for conventional air-launched, standoff, precision strike munitions. These technologies focus on the destruction of time critical, mobile, and hard targets through strike planning, launch, and delivery of semi-autonomous and autonomous precision guided munitions utilizing on-board and off-board near real time targeting data. The result will be the capability of night, adverse-weather weapons delivery with reduced exposure of the delivery aircraft to hostile fire, as well as improved weapon reliability and affordability.

(U) FY 1991 Accomplishments: Not Applicable.

(U) FY 1992 Planned Program: Not Applicable.

(U) FY 1993 Planned Program:
- (U) Initiate adverse-weather IR and RF air-to-surface guidance technologies.

Program Element: #0602602F Budget Activity: #1 - Technology Base
PE Title: Conventional Munitions

- (U) Initiate developments to reduce cost of synthetic aperture radar, laser radar, and signal processor components.

(U) Work Performed By: This project is managed by Wright Laboratory's Armament Directorate, Eglin AFB FL. Contractors have not been selected.

(U) Related Activities:
(U) PE 0602102F, Materials.
(U) PE 0602201F, Aerospace Flight Dynamics.
(U) PE 0602202F, Human Systems Technology.
(U) PE 0602203A, Missile Technology.
(U) PE 0602204F, Aerospace Avionics.
(U) PE 0602702F, Command/Control/Communications.
(U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
(U) PE 0603245F, Advanced Fighter Technology Integration.
(U) PE 0603601F, Conventional Weapons Technology.
(U) PE 0604618F, Joint Direct Attack Munitions.
(U) The specific projects have been coordinated and fully integrated with Army, Navy, Air Force, and DARPA plans to insure non-duplication and compatibility with the integrated demonstrations.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 06RA Laboratory Operations | 41,506 | 41,102 | 42,245 | Cont | TBD |
| 2338 Reliability Sciences Technology | 4,438 | 4,592 | 5,095 | Cont | TBD |
| 4082 Space Subsystems C3I | 0 | 0 | 6,800 | Cont | TBD |
| 4170 Advanced EHF Communications Satellite Technology | 0 | 0 | 3,000 | Cont | TBD |
| 4180 Advanced Surveillance Satellite Technology | 0 | 0 | 12,000 | Cont | TBD |
| 4182 Command and Control for Precision Strike | 0 | 0 | 7,000 | Cont | TBD |
| 4506 Surveillance Technology | 6,816 | 8,487 | 8,430 | Cont | TBD |
| 4519 Communications Technology | 3,379 | 4,003 | 4,175 | Cont | TBD |
| 4594 Intelligence Technology | 5,688 | 6,007 | 7,055 | Cont | TBD |
| 4600 Electromagnetic Technology | 10,384 | 10,344 | 11,799 | Cont | TBD |
| 5581 Command & Control Technology | 6,471 | 7,146 | 7,720 | Cont | TBD |
| Total | 78,682 | 81,681 | 115,319 | Cont | TBD |

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, diagnostic capability, and electromagnetic environmental performance; 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 eight technology areas: reliability sciences; space subsystems; global surveillance and communications; surveillance; communications; intelligence; electromagnetics; and command and control. Projects 4170, 4180, and 4182, which begin in FY 1993, support the DOD Science & Technology initiatives in Global Surveillance and Communications and Precision Strike. Additional funds have been added to support the Air Force initiative in Space Subsystems Technology, which is a complement to the OSD initiative in Global Surveillance and Communications.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

1. (U) Project 06RA, Laboratory Operations: This project provides for 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 complement all other projects in this PE.

2. (U) Project 2338, Reliability Sciences Technology: The Air Force needs technology which increases reliability and diagnostic capability for electronic devices and systems while assessing electromagnetic environmental performance. 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 diagnostic 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; and computer-aided design for reliability, maintainability, and testability.

(U) FY 1991 Accomplishments:
- (U) Developed multichip module (MCM) testability techniques to ensure high quality, highly reliable microcircuits which can be tested, diagnosed, and repaired.
- (U) Developed integrated chip-to-system approach for a testable design for top-down allocation of system testability requirements.

(U) FY 1992 Planned Program:
- (U) Develop and update state-of-the-art reliability prediction models for electronic devices to assess the reliability of advanced devices when no previous reliability data exists.
- (U) Develop applications for Time Stress Management Devices (TSMDs) to analyze and correct design deficiencies which result in Retest OK and Cannot Duplicate maintenance actions in Air Force operational systems.

(U) FY 1993 Planned Program:
- (U) Develop a general purpose, inexpensive and reliable TSMD with intelligent built-in-test for incorporation into operational systems for significant system life cycle cost savings.
- (U) Define a cost-effective methodology for obtaining test equipment for Air Force depot and organizational levels which will lead to improved operational readiness and supportability.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB, NY. Major contractors: General Electric, Pittsfield, MA; General Electric, Morrestown, NJ; University of Maryland, College

Park, MD; Honeywell Inc., Minnesota, MN; and TRW, Redondo Beach, CA.

(U) Related Activities:
- (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, Producibility, Reliability, Availability and Maintainability (PRAM).
- (U) This program has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 1991 Accomplishments:
- (U) None.

(U) FY 1992 Planned Program:
- (U) None.

(U) FY 1993 Planned Program:
- (U) Initiate development of innovative antenna and electronics technologies to enhance performance while addressing system weight, cost, and efficiency.
- (U) Initiate signal processing algorithm/architecture development for 1000 times improvement 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 for real-time support to theater operations.
- (U) Initiate development of next generation simulation/analysis tools for use in evaluating the impact of technology advances on potential radar performance.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB, NY. Contractors will be competitively selected.

(U) Related Activities:
(U) PE 0603428F, Space Subsystems Technology.

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 4170, Advanced Extremely High Frequency (EHF) Communications Satellite Technology: This project will develop technologies that support a light weight experimental EHF communications payload demonstration. The technologies developed will support a standard "bolt-on" payload that will interface to and be hosted on the Advanced Standard Satellite Bus (ASSB). Increased performance, affordability, and interoperability will be given highest priority. This effort is part of the DARPA-led, joint-Service Advanced Satellite Technologies and EHF Communications (ASTEC) demonstration. It supports the DoD Advanced Technology Demonstration for Global Surveillance and Communications Integrated Demonstration (e.g. EHF Advanced Communications).

(U) FY 1991 Accomplishments:
- (U) None.

(U) FY 1992 Planned Program:
- (U) None.

(U) FY 1993 Planned Program:
- (U) Initiate design of reliable, high efficiency, light weight EHF Microwave Integrated Circuits (MIC) and Monolithic Microwave Integrated Circuit (MMIC) components and subsystems.
- (U) Initiate design and development of high gain uplink nulling antennas and high Effective Isotopically Radiated Power (EIRP) downlink transmit antennas.
- (U) Initiate waveform analysis to support survivable high data rate links for ASTEC Demonstration.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB, NY. Contractual actions will be competitively awarded.

(U) Related Activities:
- (U) PE 0603226E, Experimental Evaluation of Major Innovative Technologies.
- (U) PE 0603006A, C3.
- (U) PE 0603726F, C3I Subsystems Integration.
- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0603401F, Advanced Spacecraft Technology.
- (U) PE 0602782A, C3 Technologies.
- (U) This project has been coordinated and fully integrated with Army, Navy, Air Force, and DARPA plans to insure nonduplication and compatibility with the integrated demonstrations.

(U) Other Appropriation Funds: Not Applicable.

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 4180, Advanced Surveillance Satellite Technology: This project will develop advanced, long lead surveillance technologies for application to global surveillance, adverse-weather precision strike targeting, and battle damage assessment. These technologies will be evaluated in an experimental satellite to demonstrate integrated performance of advanced technologies. Increased performance, affordability, and interoperability will be given highest priority. This effort is part of the Air Force led, joint-Service/DARPA Advanced Surveillance Satellite Technologies Demonstration. It contributes to the joint DoD Advanced Technology Demonstration for Advanced Surveillance Satellites.

(U) FY 1991 Accomplishments:
- (U) None.

(U) FY 1992 Planned Program:
- (U) None.

(U) FY 1993 Planned Program:
- (U) Initiate long-lead critical technologies which are independent of detailed sensor design such as command and control architecture design, and prototype electronic packages.
- (U) Size requirements for an on-board satellite signal processor to test and evaluate families of algorithms and waveforms against the target mix in various weather clutter and electronic counter-measure conditions.
- (U) Support development of Technology Program Management Plan.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB, NY. Contractual actions will be competitively awarded.

(U) Related Activities:
- (U) PE 0603726F, C3I Subsystems Technology.
- (U) PE 0603428F, Space Subsystems Technology.
- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0602102F, Materials.
- (U) PE 0603789F, C3I Technology Development.
- (U) This project has been coordinated and fully integrated with Army, Navy, Air Force, and DARPA plans to insure nonduplication and compatibility with the integrated demonstrations.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

6. (U) Project 4182, Command and Control for Precision Strike: This project develops the advanced command and control (C2) technologies required to support the Joint DOD Advanced Technology Demonstration for adverse-weather precision strike of fixed and mobile targets. Effective application of precision guided munitions in such

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

missions requires highly responsive C2 information management technologies to achieve greatly reduced planning and execution control timelines. The project will develop and demonstrate: Distributed Operating System and Data Base Management technologies to deal with the huge amount and multiple types of data to be managed for such functions as weapon guidance and bomb damage assessment (BDA); User Interface and Display technologies to dramatically speed operator ability to assimilate new and changing information and to make the quick decisions necessary to allocate and task the proper weapon; and Decision Support capabilities with extremely fast algorithms and procedures to schedule, sequence, allocate and de-conflict, in near real-time.

(U) FY 1991 Accomplishments:
- (U) None.

(U) FY 1992 Planned Program:
- (U) None.

(U) FY 1993 Planned Program:
- (U) Develop distributed operating system and data base management baselines that identify amount, type, and basic data structures.
- (U) Establish C2 user interface and display laboratory environment. Integrate advanced display and speech and natural language systems into lab as initial capabilities. Initiate experiments into intuitive and transparent user/display interactions.
- (U) Initiate development of a common mission planning capability which will operate in a distributed environment. Initial capabilities shall relate to weather, scheduling, and de-confliction with other strikes.
- (U) Determine applicability of technologies within Signal Intelligence, Intelligence Data Handling & Sensor Exploitation to baseline for Precision Guidance Strike subthrust.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB, NY. This project begins in FY 1993. Contracts have not been awarded.

(U) Related Activities:
(U) PE 0602204F, Aerospace Avionics.
(U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
(U) PE 0603726F, C3I System Integration.
(U) PE 0603789F, Command,Control, Communications and Intelligence Technology Development.
(U) This project has been coordinated and fully integrated with Army, Navy, Air Force, and DARPA plans to insure nonduplication and compatibility with the integrated demonstrations.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

7. (U) Project 4506, Surveillance Technology: The Air Force needs advanced ground, airborne 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 fighters.

(U) FY 1991 Accomplishments:
- (U) Developed a Multispectral fusion architecture for integrating intelligence and E-3 data to improve radar track and accuracy for non-cooperative target identification.
- (U) Designed, fabricated, and demonstrated multiband and high efficiency T/R module for advanced multispectral passive/active sensor needed for low-observable surveillance.
- (U) Developed and tested, within the laboratory, adaptive space-time processing algorithm to enhance low cross section target detection in clutter and interference.

(U) FY 1992 Planned Program:
- (U) Develop and implement an airborne multichannel, phased array, high-fidelity, data collection system to provide real data necessary to more fully validate methods for detecting small targets in clutter and jamming.
- (U) Validate multimode/multispectral airborne sensor suite designs and technology to provide flexible surveillance of atmospheric, ground, tactical missile, and maritime targets.
- (U) Develop and implement advanced signal processing algorithms and evaluate their performance through a distributed processing architecture to provide enhanced radar detection, tracking, and anti-jam performance.

(U) FY 1993 Planned Program:
- (U) Demonstrate an integrated transmit/receive module to do multiple functions of signal generation, reception, and processing in a single package 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 for application to low-observable surveillance systems.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss

AFB, NY. Major contractors are: SENSIS, DeWitt, NY; Westinghouse Electric, Baltimore, MD; Syracuse Research Corp., Syracuse, NY; Raytheon Co., Sudbury, MA; and Calspan Corp., Buffalo, NY.

(U) Related Activities:
(U) PE 0603789F, C3I Technology Development.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

8. (U) Project 4519, Communications Technology: The Air Force needs technologies which will provide global communications that enable the rapid application of air combat power via assured connectivity for timely, reliable, responsive, affordable transfer of information. Communications must provide transparent, user-friendly connectivity using all available communications media and providing all types of communications services including the ability to surge as necessary to support rapid build-up of U.S. presence abroad. This program provides the technologies for enduring multi-level, secure, seamless networks; advanced communications processors; anti-jam (AJ) and low probability of intercept (LPI) techniques such as spread spectrum and adaptive null steering; and modular, programmable, low-cost radios and terminals for ground, airborne, and space C3I across the electromagnetic and optical spectrums. It includes electronic and photonic technologies for advanced processors and devices, advanced network protocols, artificial intelligent communications management and control, and advanced algorithms and signal processing techniques.

(U) FY 1991 Accomplishments:
- (U) Implemented error injector units to develop and evaluate advanced protocols for networks under stress.
- (U) Developed digital signal processing simulators for advanced LPI/AJ techniques.
- (U) Designed Neural Network adaptive processors that improved the jamming/cancellation performance of adaptive antenna arrays.

(U) FY 1992 Planned Program:
- (U) Demonstrate improved space communications data throughput under jamming through development of an optically-controlled null steering phased array antenna.
- (U) Complete Integrated C3I Optical processor design that will provide a major improvement in processing capability for communications systems, surveillance, and intelligence.
- (U) Demonstrate capability of beyond line-of-sight optical scatter communications for covert, compact communications.

(U) FY 1993 Planned Program:

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

- (U) Initiate critical system brassboard for adaptive multimode smart radio for demonstration and transition to Speakeasy.
- (U) Demonstrate holographic interconnects for optical high-speed processing to improve communication data rate and flexibility.
- (U) Demonstrate network routing algorithms and techniques for enhanced communications reliability and efficiency for satellite communications (SATCOM) systems.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: Westinghouse Electric, Baltimore, MD; University of Massachusetts, Amherst, MA; Physical Optics Corp., Torrance, CA; Cornell Univeristy, Ithaca, NY; and ITT Avionics Corp., Nutley, NJ.

(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

9. (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 project 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 systems; 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 1991 Accomplishments:
- (U) Demonstrated effectiveness of electronic warfare manipulative deception techniques to defeat passive collection system.
- (U) Applied Advanced Reasoning Representation to improve storage, aggregation, and analysis of intelligence information.

(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) Apply and demonstrate machine learning techniques to digital

imagery exploitation for goal of 95% probability of correct classification of targets.

(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 are: Harris, Melbourne, FL; Boeing Defense & SPC, Seattle, WA; State University-Rutgers, Piscataway, NJ; BBN Systems & Tech, Cambridge, MA; and PAR Gov't Systems Corp., New Hartford, NY.

(U) Related Activities:
(U) PE 0603260F, Intelligence Advanced Development.
(U) PE 0603726F, C3I Subsystem Integration.
(U) PE 0604750F, Intelligence Development.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

10. (U) Project 4600, Electromagnetic Technology: Future C3I surveillance, communications, and information processing systems will require improved technology for the generation, control, processing, and radiation of electromagnetic and optical energy to reduce system cost, improve system sensitivity, and increase processing rates. 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.

(U) FY 1991 Accomplishments:
- (U) Invented new crystal method for high quality, low-cost indium phosphide wafers for photonic and microwave ingrated circuits.
- (U) Developed techniques to reject ground clutter for target detection using linear and ellystical signal depolarization characteristics.
- (U) Fabricated a photonic feed system for a phased array antenna.

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

(U) FY 1992 Planned Program:
- (U) Develop spatial light modulator for phase-only correlator advanced development model to demonstrate hostile target identification capability.
- (U) Demonstrate performance monitoring of individual transmit/receive modules in a 1 x 64 column array to show possibility of improvement by a factor of 100 in ground clutter rejection in surveillance radars.
- (U) Fabricate and evaluate a multichannel photonic processor to eliminate sidelobe jamming of an antenna within the Rome Laboratory Photonics Facility.

(U) FY 1993 Planned Program:
- (U) Develop high temperature superconductor tunneling devices for low noise monolithic microwave integrated circuit components to demonstrate improved communications receiver range.
- (U) Develop 94 and 120 GHz monolithic heterostructure indium-based field effect transistor to increase the information transfer rate and range of advanced space communications systems.
- (U) Evaluate optical interconnects within an electronic computer to increase operational speed and reliability by a factor of 100.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: SRI, Menlo Park, CA; Northeastern University, Boston, MA; General Electric, Schenectady, NY; Massachusetts Technological Laboratory, West Newton, MA; and Parke Mathematical, Carlisle, MA.

(U) Related Activities:
(U) PE 0603726F, C3I Subsystem Integration.
(U) PE 0603789F, C3I Technology Development.
(U) PE 0303126F, Long Haul Communications.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

11. (U) Project 5581, Command and Control (C2) Technology: The Air Force needs technologies which provide next generation battlefield commanders with improved processing and presentation of information for real-time battle management. Technologies being developed will increase the capability, quality, and reliability while reducing the cost of computer resources in C2 systems. This project develops advanced computer software modeled after human information processing and capable of providing 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 and fault tolerance mechanisms; and

Program Element: #0602702F Budget Activity: #1-Technology Base
PE Title: Command, Control, and Communications

prototype evaluators; and develops technologies associated with knowledge-based systems, expert systems, and distributed databases.

(U) FY 1991 Accomplishments:
- (U) Demonstrated distributed database management system for Tactical Air Control System.
- (U) Transitioned the Dynamic Analysis and Replanning System (DART) to over ten operational sites within TRANSCOM, EUCOM, LANTCOM, PACOM, CENTCOM, and MAC.

(U) FY 1992 Planned Program:
- (U) Demonstrate Knowledge-Based Software Assistant (KBSA) for formal software specification and verification to prove orders of magnitude improvement in software productivity are possible with KBSA technology.
- (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 C2 systems survivability.

(U) FY 1993 Planned Program:
- (U) Develop capability to simultaneously control the data processing and communications resources in a distributed C2 system to provide load balancing and graceful performance degradation in a failure prone environment.
- (U) Develop/demonstrate a computer-based tool to generate production quality software directly from user specified requirements to eliminate code and design errors and improve productivity by a factor of two.
- (U) Develop model of configuration management for highly incremental environment of the KBSA to allow "intelligent" software tools to work together and keep each other and humans informed of all critical changes and progress.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: U.S. Small Business Corp., San Antonio, TX; University of Rochester, Rochester, NY; SRI International, Menlo Park, CA; Honeywell Sensor & Systems, Minneapolis, MN; and University of Massachusetts, Cambridge, MA.

(U) Related Activities:
(U) PE 0603728F, Advanced Computer Technology.
(U) PE 0603789F, C3I Technology Development.
(U) PE 0603617F, C3 Applications.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2745 Logistics for Combat Weapon System Maintenance and Support | 100 | 500 | 3,500 | Cont | TBD |
| 2940 Technology for Design and Maintenance | 4,304 | 5,649 | 7,897 | Cont | TBD |
| 2950 Improved Logistics and Maintenance Performance | 6,600 | 0 | 3,588 | Cont | TBD |
| Total | 11,004 | 6,149 | 14,985* | Cont | TBD |

* All Computer Aided Logistics Support (CALS) related technology has been removed from this PE. Additional logistic-related technology has been added to the PE to greatly expand the program technical scope. Increased scope is primarily in Project 2745, Logistics for Combat Weapon System Maintenance and Support. Project 2950, Improved Logistics and Maintenance Performance, has been reoriented and refocused to include a broad-based set of technologies to improve logistics and maintenance support.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology PE develops technology to reduce the cost and improve the design, acquisition, and supportability of current and future weapons systems. This PE will improve the way maintenance and support considerations are designed into weapons systems and make engineering, product support, and maintenance data electronically available throughout the lifetime of weapons systems. It will provide more realistic simulation-based logistics planning and combat capability assessment models; provide critical risk-reduction technology; and accelerate development and implementation of near-term logistics technology to shorten the time needed to meet priority logistics supportability requirements. The new focus also includes test and diagnostic technologies. 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 FY 1993:

1. (U) Project 2745, Logistics for Combat Weapon System Maintenance and Support: The objective of this project has been expanded to include additional logistics-related technologies to develop, demonstrate, and transition technology to improve the performance and supportability of Air Force weapons systems in both peacetime and deployed wartime environments. This technology reduces the time now required to get new logistics support tools and methods into field applications. Products developed also show design engineers, managers, users, and maintainers the impacts of proposed system modifications and materials on field and depot system supportability and operation prior to acquisition.

(U) FY 1991 Accomplishments:
- (U) Initiated front-end analysis to assess logistics supportability implications of Composite Wings.

Program Element: #0603106F Budget Activity: #2 - Advanced Technology Development
PE Title: Logistics Systems Technology

(U) FY 1992 Planned Program:
- (U) Continue assessment of logistics supportability for Composite Wings.
- (U) Define system repair/modification process at a selected Air Logistics Center.

(U) FY 1993 Planned Program:
- (U) Conduct integrated product design review of proposed system modification to identify possible impacts on field maintainability and supportability.
- (U) Develop and demonstrate methods for assessment and repair of battle/accident damaged aircraft when away from full intermediate maintenance facilities.
- (U) Investigate suitable alternatives to Halon 1301 to ensure engine nacelle fire suppression capability will exist after mandated phase-out of Halons.
- (U) Identify and demonstrate technologies for parachute extraction/jettison device to improve aircrew and aircraft supportability and safety.

(U) Work Performed By: Work performed and managed by the Armstrong Laboratory, Wright-Patterson AFB, OH. Contractor is Frontier Technology, Beavercreek, 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2940, Technology for Design and Maintenance: This project develops new 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 1991 Accomplishments:
- (U) Expanded logistics center access to technical databases and digitized design tools through a field demonstration.
- (U) Demonstrated system for improved reliability and maintainability in the design of weapon systems.
- (U) Demonstrated preliminary computer tools to capture and trace user system requirements in design, resulting in more affordable weapons systems that meet users needs.

(U) FY 1992 Planned Program:
- (U) Refine computer model of maintenance technicians to include estimation of maintenance times.
- (U) Deliver integrated data exchange and control of paperless design of weapon system modifications from demonstration to routine operation, greatly reducing ALC costs.

Program Element: #0603106F Budget Activity: #2 - Advanced Technology Development
PE Title: Logistics Systems Technology

- (U) Develop better, lower cost methods to model 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 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: Work performed and managed by Armstrong Laboratory, 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2950, Improved Logistics and Maintenance Performance: This project has been reoriented to exclude CALS related technologies. This project now develops technologies that will improve logistics and maintenance support including: development and demonstration of critical risk-reduction technology essential to field and depot maintenance operations; implementation of near-term logistics technology to shorten the time between user requirement and usable product delivery; and development and field demonstration of technologies for the flight-line maintenance technician. This will allow replacement of the paper-based technical order system and integration of all information required by the technician to inspect, troubleshoot, repair, and report through use of a hand-held computer maintenance aid. Estimated savings are in the hundreds of millions of dollars for both operational commands and depot maintenance operations. This project is coordinated with all three Services, and products are being applied to many current and future systems, such as the F-16, F/A-18, B-2, JSTARS, F-22, and the Army M1A1 tank. Commercial industry is interested in applying these technologies to improve maintenance and support of airliners and automobiles.

(U) FY 1991 Accomplishments:
- (U) Accomplished Preliminary Design Review for Integrated Maintenance Information System (IMIS) field demonstration.
- (U) Provided refined draft specifications for procurement of Type C data to Air Force Logistics Command (AFLC), other DoD agencies, and industry.

(U) FY 1992 Planned Program:
- (U) FY 1992 funding for the IMIS program was moved by Congressional action to the OSD Computer-Aided Logistics Support (CALS) System. IMIS progress will be reported by OSD.

Program Element: #0603106F Budget Activity: #2 - Advanced Technology Development
PE Title: Logistics Systems Technology

(U) 1993 Planned Program:
- (U) Conduct a base-level field test on the F-16 demonstrating and validating integrated maintenance technology.
- (U) Conduct analysis to determine the payoff of integrated maintenance information for on-the-job training of maintenance technicians.
- (U) Complete validated specifications for procurement of integrated maintenance components.

(U) Work Performed By: Work performed and managed by the Armstrong Laboratory, 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 Integrated Maintenance Diagnostics Systems.
(U) PE 0603721N, Integrated Diagnostic Support.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603109F
PE Title: INEWS/ICNIA

Budget Activity: #2 - Advanced Technology Development

A. (U) RESOURCES (S in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2273 Integrated Electronic Warfare System (INEWS) | 4,440 | 0 | 0 | 0 | 73,682 |
| 2538 Integrated Communications, Navigation, Identification Avionics (ICNIA) | 16,468 | 0 | 0 | 0 | 110,365 |
| 2734 Very High Speed Integrated Circuits (VHSIC) - based Subsystems | 8,394 | 0 | 0 | 0 | 98,471 |
| 3003 Common Signal Processor (CSP) | 0 | 0 | 0 | 0 | 37,098 |
| 3062 Pave Sprinte | 0 | 0 | 0 | 0 | 3,100 |
| Total | 29,302 | 0 | 0 | 0 | 322,716 |

B. (U) BRIEF DESCRIPTION OF ELEMENT: Provided 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. Built 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.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 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 suite of the ATF, with applicability to the LH.

(U) FY 1991 Accomplishments:
- (U) Completed INEWS Technology Development Program.
- (U) EMD Program contained within the ATF PE#0604239F.

(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 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.

Program Element: #0603109F
PE Title: INEWS/ICNIA

Budget Activity: Activity Technology Development

(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 (EMD).
- (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, multi-function antennas--applicable to the integrated avionics suites of ATF/LH. Studies and develops specification and standards for international, collaborative CNI and advanced avionics architectures.

(U) FY 1991 Accomplishments
- (U) Completed ICNIA Technology Development Program.
- (U) EMD Program contained within the ATF PE#0604239F.

(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.

(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 (EMD).
- (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

Program Element: #0603109F
PE Title: INEWS/ICNIA

Budget Activity: Activity Technology Development

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 1991 Accomplishments
- (U) Completed VHSIC program technology risk reduction in support of ATF development.
- (U) EMD Program contained within ATF PE#0604239F.

(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 Wright Laboratories and Avionics Laboratories, Wright-Patterson AFB, OH.
- (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 #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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603112F
PE Title: Advanced Materials for Weapons Systems
Budget Activity: #2 Advanced Technology Development

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2100 Laser Hardened Materials | 11,020 | 10,048 | 9,174 | Cont | TBD |
| 3153 Non-destructive Inspection Development | 2,851 | 3,058 | 4,078 | Cont | TBD |
| 3946 Materials Transition | 834 | 2,781 | 4,583 | Cont | TBD |
| Total | 14,705 | 15,887 | 17,835 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Advanced Development program demonstrates laser hardening techniques, non-destructive inspection/evaluation (NDI/E) technologies, and technology maturation of new aerospace materials. It develops 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; 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. The new technologies are required to provide current and new aeronautical and aerospace systems the capability to protect against laser threats, to reliably inspect aeronautical structures, and to improve the operational performance, reliability, affordability, and supportability of current and advanced war fighting systems.

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

1. (U) Project 3153, Non-destructive Inspection Development: Develops and demonstrates advanced NDI/E methods and procedures to accurately monitor performance integrity and detect failure-causing defects/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 war fighting systems, for example, by deactivating fighter wings, and the need for rapid sortie generation demand an ability to perform real-time inspections faster than 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 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 Budget Activity: #2 Advanced Technology Development
PE Title: Advanced Materials for Weapons Systems

(U) FY 1991 Accomplishments:
- (U) Completed design and component selection for breadboard portable real-time filmless X-ray non-destructive inspection (NDI) system for rapid, reliable, and cost-effective field and depot inspections.
- (U) Completed initial design of system to rapidly inspect accessible surfaces of large composite structures on conventional and future aircraft.

(U) FY 1992 Planned Program:
- (U) Complete development testing and evaluation of the backscatter imaging X-ray Computed Tomography (XCT) system and demonstrate the system to industry.
- (U) Complete the XCT aeronautical system applications program testing and analysis, and demonstrate the system to industry.
- (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) Complete demonstrating the Computed Tomography NDI methods for aeronautical systems to industry.
- (U) Begin developing an eddy current NDI system that will locate hidden flaws in complex structures.
- (U) Continue to develop the portable real-time filmless X-ray NDI system for field and depot inspection and several large composite structure NDI systems for airframes.

(U) Work Performed By: The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages this project. The major contractors are: Northrop Aircraft Co., Hawthorne, CA; Boeing Aerospace Co., Seattle, WA; Lockheed Missiles and Space, Palo Alto, CA; Advanced Research and Applications Corp., Sunnyvale, CA; and McDonnell Aircraft Co., St. Louis, MO.

(U) Related Activities:
(U) Program Element #0602102F, Materials.
(U) Program Element #0708011F, Industrial Base Program.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3946, Materials Transition: Develops necessary processing and scale-up data for new classes of advanced materials to shorten transition times into system applications and prove manufacturing feasibility. Provides the detailed engineering data and failure/fatigue behavior required by designers. Growth is for increased efforts in supersonic infrared (IR) window materials.

Program Element: #0603112F Budget Activity: #2 Advanced Technology Development
PE Title: Advanced Materials for Weapons Systems

(U) FY 1991 Accomplishments:
- (U) Developed initial process/engineering data base on single crystal nickel aluminide for turbine blades.
- (U) Developed initial engineering data base for designing ceramic matrix composite (CMC) thrust vectoring aircraft nozzles to improve temperature performance and radar signature control.

(U) FY 1992 Planned Program:
- (U) Improve the Mach 2 rain erosion resistance and low speed durability of infrared window materials.
- (U) Establish corrosion data base on advanced materials being transitioned from program element (PE) #0602102F.
- (U) Optimize, scale-up, and prepare Thermally Resistant Aircraft Control Coating (TRACC) for flight testing to meet strategic requirement.
- (U) Develop property/processes data base on 700°F organic matrix composite (OMC) system developed in PE #0602102F.

(U) FY 1993 Planned Program:
- (U) Complete TRACC effort.
- (U) Continue the nickel aluminide turbine blade processing effort.
- (U) Continue the durable erosion resistant infrared window effort.
- (U) Continue establishment of a corrosion data base.
- (U) Continue the CMC thrust vectoring nozzleeffort.
- (U) Continue development of property/process data base for 700°F OMC system efforts.

(U) Work Performed By: The Wright Laboratory, Materials Directorate, Wright-Patterson AFB, OH, manages this project. The major contractors are: General Electric, Cincinnati, OH, and University of Dayton Research Institute, Dayton, OH. The remaining contractors will be determined by competitive source selection.

(U) Related Activities:
- (U) Program Element #0602102F, Materials.
- (U) Program Element #0603211F, Aerospace Structures.
- (U) Program Element #0603202F, Aerospace Propulsion Subsystem Integration.
- (U) Program Element #0603216F, Aerospace Propulsion and Power Technology.
- (U) Program Element #0708011F, Industrial Base Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603112F
PE Title: Advanced Materials for Weapons Systems
Project Number: 2100
Budget Activity: #2 - Advanced Technology Development

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

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Laser Hardened Materials | 11,020 | 10,048 | 9,174 | 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/airborne systems and personnel against laser radiation. A significant threat in the former Soviet Union, third world countries, and terrorists exists for all Air Force systems and aircrews, and is projected to grow considerably in the near term. The goal is to ensure 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 to aircrew, sensors, and structures. 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 1991 Accomplishments:
   - (U) Completed development of high temperature laser hardened transparency materials system; transitioned results into a new integrated transparency effort that scales up the hardening technique to a canopy section.
   - (U) Completed testing advanced broadband laser eye and sensor protection; transitioned personnel hardening technology to an implementation program.
   - (U) Developed design data for transitioning hardening materials to aeronautical systems.
   - (U) Selected, fabricated, and tested components to evaluate laser vulnerability of aircraft structural materials; modelled damage and assessed system and mission implications.
   - (U) Completed design of Survivable High-Performance Sensor Program, which will allow fabrication/evaluation of the best laser survivable sensor techniques.
   - (U) Completed selection of most promising advanced materials and processes for optical limiter devices for protecting electrooptic sensors against laser radiation.

Program Element: #0603112F
PE Title: Advanced Materials for Weapons Systems
Project Number: 2100
Budget Activity: #2 - Advanced Technology Development

2. (U) FY 1992 Planned Program:
   - (U) Transition optical bandpass filter technology made with metallic sub-micron structure patterns to developers of forward looking infrared windows and infrared/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) Begin 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, and advanced materials and processes for optical limiter devices.

3. (U) FY 1993 Planned Program:
   - (U) Complete the integrated transparency effort started in FY 1991; 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) Determine directions for future structural materials hardening efforts based on findings from the joint Flight Dynamics/ Materials Survivability and Vulnerability Evaluation of aircraft.
   - (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 switches, lightweight broadband night vision capable protection for aircrews, and data for transitioning hardening materials to aeronautical systems.

4. (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; Hughes Corp, Los Angeles, CA; and Science Applications International Corp, Dayton, OH.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.

Program Element: #0603112F Project Number: 2100
PE Title: Advanced Materials for Weapons Systems Budget Activity: #2 - Advanced Technology Development

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

F. (U) PROGRAM DOCUMENTATION:
- (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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

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 Design Review | Mar 1993 |
| 5. | (U) "Smart" Laser Eye Protection for Aircrews Design Review | Jun 1994 |
| 6. | (U) Survivable High Performance [All-Purpose] Sensor Design Review | Dec 1994 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603202F
PE Title: Aircraft Propulsion Subsystem Integration (APSI)
Project Number: 668A
Budget Activity: #2 - Advanced Technology Development

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

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| APSI | 20,340 | 28,695 | 29,169 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This science and technology program element provides for the design, test, and assessment of airbreathing propulsion system technologies applicable to a broad range of aircraft. The APSI program has three distinct technology areas. The major technology focus embodies the development and testing of demonstrator engines within the Joint Technology Demonstrator Engine (JTDE) program for manned systems and within the Joint Expendable Turbine Engine Concept (JETEC) program for unmanned (missile) applications. A second area develops system component technology such as that required for low pressure fans and turbines, engine controls, and nozzles. A third area includes system integration issues such as inlets, exhaust systems, engine/airframe compatibility, and low observable technologies. The APSI program will provide aircraft with the 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 totally integrated DOD, DARPA, NASA, and industry effort focused on doubling turbine engine propulsion capabilities while reducing cost of ownership. The IHPTET program structure provides intermediate technology transition for turbine engine upgrades and derivatives.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Demonstrated fighter engine technologies with a 22% improvement in thrust-to-weight and 15% fuel savings. Technologies include low aspect ratio swept hollow fan blades, double annular combustors, high work low pressure turbines, and a variety of advanced composite material applications.
   - (U) Completed design and began fabrication of multifunctional nozzle providing new capability for low observable thrust vectoring.
   - (U) Completed test plan and initiated testing of "uncooled" carbon/carbon turbine to increase turbine temperature capability by 1200°F.
   - (U) Demonstrated a 35% improvement in specific thrust and a 20% reduction in fuel consumption for missile engine demonstrators. Technologies include composite inlet guide vanes, mixed flow

Program Element: #0603202F
PE Title: Aircraft Propulsion Subsystem Integration (APSI)
Project Number: 668A
Budget Activity: #2 - Advanced Technology Development

compressors and turbines, uncooled carbon-carbon turbines, and advanced digital electronic control systems.

2. (U) FY 1992 Planned Program:
   - (U) Fabricate hollow titanium metal matrix composite fan blades which will save 46% (95 lbs) in weight compared to conventional solid titanium blades.
   - (U) Complete engine tests on lightweight metal matrix composite support structures demonstrating increased vibration damping capability with a 25% (80 lbs) weight reduction.
   - (U) Complete testing of carbon/carbon turbine for man-rated engines providing 45% weight reduction and elimination of cooling air.
   - (U) Complete preliminary design of dry supercruise technology configuration with low subsonic/supersonic fuel consumption and high thrust-to-weight capability for tactical fighters.
   - (U) Complete fabrication and initiate assembly of next generation expendable demonstrator engines.

3. (U) FY 1993 Planned Program:
   - (U) Demonstrate fighter engine technologies with a 30% increase in thrust-to-weight and 20% fuel savings. Technologies include hollow metal matrix composite compressor fan blades, transpiration cooled turbine vanes, super cooled blades, and multifunctional nozzles.
   - (U) Fabricate advanced capability exhaust systems incorporating composite and metallic structures technology providing significant reductions in weight, cooling flow, cost, and observables for man-rated systems.
   - (U) Fabricate supercooling turbine components for a 3-5X life improvement and a 20% increase in thrust for current fighter engine upgrades and derivatives.
   - (U) Conduct initial testing of expendable missile demonstrator engines with a capability of 70% specific thrust improvement and 30% reduction in fuel consumption. This provides a longer standoff capability, increased terminal survivability, and places time urgent/high value targets at risk.
   - (U) Conduct expendable missile demonstrator engine testing of an advanced exhaust system cooling concept to improve infrared and radar cross section signature.

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

D. (U) WORK PERFORMED BY: Contracts managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The current contractors involved in this program are: Allison Gas Turbine Division, Indianapolis, IN; Garrett Engine Division, Phoenix, AZ; General Electric, Evendale, OH; Pratt & Whitney, West Palm Beach, FL; Teledyne CAE, Toledo, OH; and Williams International, Walled Lake, MI.

Program Element: #0603202F
PE Title: Aircraft Propulsion Subsystem Integration (APSI)
Project Number: 668A
Budget Activity: #2 - Advanced Technology Development

E. (U) COMPARISON WITH FY 1992 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) Not Applicable.

G. (U) RELATED ACTIVITIES:
(U) PE #0602203F, Aerospace Propulsion.
(U) PE #0602102F, Materials.
(U) PE #0602201F, Aerospace Flight Dynamics.
(U) PE #0603211F, Aerospace Structures.
(U) PE #0603216F, Aerospace Propulsion and Power Technology.
(U) PE #0602122N, Aircraft Technology.
(U) PE #0602234N, System Support Technology.
(U) PE #0603210N, Aircraft Propulsion.
(U) PE #0603003A, Aviation Advanced Technology.
(U) PE #0708011F, Manufacturing Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

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

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

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. | (U) Initiated man-rated multifunctional nozzle fabrication | Jan 91 |
| 2. | (U) Completed testing of first ever carbon/carbon turbine for man-rated engines | Jan 92 |
| 3. | (U) Fabricate and assemble next generation missile demonstrator engines | Jun 92 |
| 4. | (U) Complete preliminary design of man-rated supercruise engine | Dec 92 |
| 5. | (U) Fabricate hollow metal matrix composite fan blades for man-rated engines | Feb 93 |
| 6. | (U) Sea level test missile demonstrator engine | May 93 |
| 7. | (U) Infrared signature test missile demonstrator engine | Sep 93 |
| 8. | (U) Complete detailed design of man-rated supercruise engine | Dec 93 |
| 9. | (U) Test supercooled turbine components for current man-rated engine upgrades & derivatives | Dec 93 |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 69CK Advanced Electronics | 5,249 | 5,548 | 6,254 | Cont | TBD |
| 69DF Attack Management | 5,860 | 5,871 | 8,925 | Cont | TBD |
| 665A Electro-Optical Targeting Sensors | 7,120 | 7,215 | 15,737 | Cont | TBD |
| 1177 Target Recognition | 5,092 | 5,806 | 8,497 | Cont | TBD |
| 2334 Airborne Radar Electronic Counter-Countermeasures | 5,321 | 4,915 | 5,799 | Cont | TBD |
| 2345 Covert Airborne Communications | 3,271 | 4,646 | 6,405 | Cont | TBD |
| Total | 31,913 | 34,001 | 51,617 | 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. Specifically, this program develops advanced electro-optical sensors for target acquisition, improved techniques for target identification, electronic counter-countermeasures for tactical airborne radars, covert airborne communications, fire control/weapon delivery for both air and ground targets, and advanced electronic devices for military needs. Special emphasis is given to developing critical active and passive sensor technologies required to increase electro-optical sensor capabilities to detect, locate and target both airborne and fixed/mobile time-critical ground targets. The focus of this effort is to provide avionics technology for flexible, multi-function/multi-mission aircraft that can safely penetrate threat areas, destroy multiple ground targets per pass, and 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 subsystems 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. Additional FY 1993 funding of $2,000 in project 69DF and $2,000 in 1177 was added to support DOD Science and Technology thrust in Precision Strike, $5,000 for Air Force air-to-air infrared search and track sensor development and $8,600 to support Air Force increased emphasis in Avionics.

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

Program Element: #0603203F Budget Activity: #2-Advanced Technology Development
PE Title: Advanced Avionics for Aerospace Vehicles

1. (U) Project 69CK, Advanced Electronics: This is the main Air Force 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, microwave (MW) and microelectronic (ME) packaging and interconnect techniques, and integration of laser radar sources and detectors.

(U) FY 1991 Accomplishments:
- (U) Designed ME packaging/power effort for signal processors.
- (U) Demonstrated a 6 Gigasample per second, 6 bit analog to digital convertor for high speed sensor operations.
- (U) Developed MW packaging and interconnects for high performance, reliable, and economical radar and ECM 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 airborne radar applications.
- (U) Demonstrate backplane power module for lower cost, reliable power distribution systems.

(U) FY 1993 Planned Program:
- (U) Develop a detector for a mid-infrared active ECM capability.
- (U) Demonstrate packaging/interconnect design for 10 times performance and high reliability radar signal processors.
- (U) Develop X-band ADCs for tactical radar/pre-processing integration for faster, better target detection.

(U) Work Performed By: Wright Laboratory, Wright Patterson AFB OH, manages this project. Contractors include: Hughes, El Segundo CA; TI, Dallas TX; AT&T, Murray Hill NJ; Rockwell, Thousand Oaks CA; and Honeywell, Bloomington, NM.

(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreement : Not Applicable.

2. (U) Project 69DF, Attack Management: This project develops the technology to effectively integrate all available fire control information to provide the pilot with increased precision strike efficiency and reduced exposure to hostile fire. Fire control

Program Element: #0603203F Budget Activity: #2-Advanced Technology Development
PE Title: Advanced Avionics for Aerospace Vehicles

technologies include integration of avionics and weapons fire control systems, attack management crew decision aids, intra-flight mission management, and cooperative engagement techniques. These will improve combat performance against both air and ground targets. Current emphasis includes demonstration of avionics fire control integrated with existing weapons to improve weapon delivery accuracies.

(U) FY 1991 Accomplishments:
- (U) Validated the ability to deliver multiple air-to-ground weapons in a single pass over target area through TAC evaluation.
- (U) Evaluated Air-to-Air Attack Management (A3M) effectiveness through pilot-in-the loop comparative testing with simulated generic tactical fighter aircraft to validate internetted flight capability.

(U) FY 1992 Planned Program:
- (U) Develop an integrated fire control and weapon delivery (IFWD) solution to improve accuracy and flexibility for tactical aircraft carrying air-to-air missiles.
- (U) Develop a fire control system using synthetic aperture radar for precision weapon delivery.
- (U) Initiate development of an automated tactical air-to-ground precision weapon delivery system to attack time-critical, high-value targets.

(U) FY 1993 Planned Program:
- (U) Develop air-to-surface internetted fire control flight algorithms for real-time strike planning against mobile ground targets.
- (U) Develop synthetic aperture radar (SAR) precision weapon delivery techniques.
- (U) Integrate new fire control software with an advanced air-to-air missile into F-15 simulator to demonstrate improved system effectiveness through precision weapon delivery.

(U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB OH, manages this project. Contractors include: McDonnell Douglas, St. Louis MO; Northrop, 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 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 1991 Accomplishments:
- (U) Designed a model based vision algorithm for recognition of critical mobile ground targets.
- (U) With Foreign Technology Division, designed a synthetic signatures data base for aircraft identification.
- (U) Validated non-cooperative target identification (NCTI) algorithms for high confidence all-aspect identification.

(U) FY 1992 Planned Program:
- (U) Real-time demonstration of Ultra-High Range Resolution (UHRR) Non-Cooperative Target Identification (NCTI) in a ground-to-air mode.
- (U) Demonstrate model-based air-to-air target recognition algorithms in air target simulator for air-to-air identification.
- (U) Collect data for evaluation of automated target cuer (ATC) for LANTIRN.

(U) FY 1993 Planned Program:
- (U) Conduct 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 test.
- (U) Complete integration and flight test of ATC to support LANTIRN P3I decision making process.

(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 #602204F, Aerospace Avionics.
- (U) PE #603789F, Command, Control, and Communication Technology.
- (U) PE #603742F, Non-Cooperative Target Recognition Technology.
- (U) Efforts are coordinated through the Non-Cooperative Target Recognition (NCTR) working group.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

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

4. (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 1991 Accomplishments:
- (U) Fabricated Electronic-Combat Multifunction Radar Technology (EMR-T) critical components.
- (U) Assessed radar ECM vulnerabilities quantitatively by laboratory testing to expand the technical data base on airborne radar.
- (U) Identified techniques to combat the high priority terrain-bounce jamming ECM threat to minimize airborne radar susceptibilities.
- (U) Developed offensive ECCM Simultaneous Transmit and Receive (STAR) strategies for simultaneous radar/ECM/ESM operation.

(U) FY 1992 Planned Program:
- (U) Rooftop test the STAR ECCM strategies prior to integration with the critical components of the next generation radar.
- (U) Validate ECCM techniques to resolve user-defined threats through flight test and transition.
- (U) Develop an active side-mounted array for fighter aircraft to increase weapon effectiveness with higher survivability.

(U) FY 1993 Planned Program:
- (U) Test and evaluate the critical components of the EMR-T system for incorporation into future flight test.
- (U) Develop architecture for a flyable radar ECCM demonstration Brassboard.
- (U) Develop methods/strategies to combat future ECM threats defined by user for flight test evaluation.
- (U) Demonstrate feasibility of side-mounted active array.

(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 2345, Covert Airborne Communications: Radio system detectability must be reduced to keep communications from being the

Program Element: #0603203F Budget Activity: #2-Advanced Technology Development
PE Title: Advanced Avionics for Aerospace Vehicles

mechanism by which aircraft are detected. Advanced designs of radio frequency and digital electronic assemblies are being developed to maintain common combat data link hardware compatibility and interoperability as Low Probability of Intercept (LPI) and Jam Resistant (JR) technologies are transitioned.

(U) FY 1991 Accomplishments:
- (U) Completed subsystem fabrication for two low data rate covert radio terminals.
- (U) Began detailed design of LPI intra-flight data link at 100-500 Kb/s to transmit raw sensor data for cooperative fire control and platform positioning.

(U) FY 1992 Planned Program:
- (U) Complete preliminary design of LPI intra-flight data link system responsive to tactical communication requirements.
- (U) Complete transition of Airborne Imagery Transmission (ABIT) technology air-to-air data link technology to a reconnaissance user.
- (U) Document projected performance of LPI and JR low data rate covert terminals.

(U) FY 1993 Planned Program:
- (U) Complete critical design and fabricate three LPI intra-flight data link terminals.
- (U) Finalize test and evaluation program for tactical data link.

(U) Work Performed By: This project is managed by Wright Laboratory at Wright Patterson AFB OH. Contractors involved are: Qualcomm, Inc, San Diego CA; Paramax (formerly Unisys), Salt Lake City UT; ITT Avionics, Nutley NJ; and TRW, San Diego CA.

(U) Related Activities:
- (U) PE #0602204F, Aerospace Avionics.
- (U) PE #0603253F, Advanced Avionics Integration.
- (U) PE #0207217F, Tactical Air Reconnaissance System.
- (U) This program supports and is coordinated with the Tri-service Defense Support Program office.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603203F
PE Title: Advanced Avionics for Aerospace Vehicles
Project Number: 665A
Budget Activity: #2-Advanced Technology Development

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

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Electro-Optical Targeting Sensors | 7,120 | 6,215 | 15,737 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This Science and Technology project develops the electro-optical 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. It develops passive infrared search and track sensors that are used to provide covert capability for first shot/first kill air superiority. Increased emphasis in FY 1993 is for development of passive search and track system technology to address increased user interest.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Initiated focal plane array design rule development for air-to-air covert sensor and plan passive ranging experiment.
   - (U) Began critical component fabrication of strategic targeting laser radar.

2. (U) FY 1992 Planned Program:
   - (U) Design an affordable passive infrared sensor, capable of use in the supersonic cruise flight regime, that can detect and track airborne targets in a look-down mode against an earth clutter background.
   - (U) Assemble and laboratory test critical components of a long range laser radar test bed.
   - (U) Demonstrate high density infrared focal plane and passive ranging algorithms for a dual offensive and defensive air-to-air threat tracking sensor.

3. (U) FY 1993 Planned Program:
   - (U) Begin fabrication of the supersonic cruise capable, look-down infrared air-to-air targeting sensor.
   - (U) Develop and test laser radar technology to enhance attack capabilities against relocatable targets.
   - (U) Develop an integrated active passive sensor for both tactical and strategic missions against ground targets.

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

Program Element: #0603203F
PE Title: Advanced Avionics for Aerospace Vehicles
Project Number: 665A
Budget Activity: #2-Advanced Technology Development

D. (U) WORK PERFORMED BY: The Wright Laboratory, Wright-Patterson AFB OH, manages this project. Contractors include: Hughes Aircraft Company, El Segundo CA; Martin Marietta, Orlando FL; Loral Infrared Imaging Systems, Lexington MA; Rockwell International, Anaheim CA; and Ford Aerospace, Newport Beach CA.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: This project had a new program added to develop an advanced infrared search and track set to meet Tactical Air Command fighter requirements for a passive target detection and track capability. This program will develop an affordable advanced infrared search and track technology demonstrator to detect and track airborne targets.
2. (U) SCHEDULE CHANGES: A program to develop an active/passive sensor to detect, identify ground targets for attack was delayed due to cancellation of PE #0603367F, Strategic Relocatable Targets, which would have co-funded this technology risk reduction project in FY 1992 and FY 1993.
3. (U) COST CHANGES: Additional funding has been added to this project due to the high user interest in an advanced technology demonstrator of passive infrared sensors for air-to-air combat applications.

F. (U) PROGRAM DOCUMENTATION:
- (U) TAC Future Fighter Requirements Statement (TAC/DR ltr, 14 Mar 90).
- (U) TAF SON 304-83, Advanced Tactical Fighter

G. (U) RELATED ACTIVITIES:
(U) PE #0602204F, Aerospace Avionics.
(U) PE #0603112F, Advanced Materials for Weapons Systems.
(U) PE #0603253F, Advanced Avionics Integration.
(U) PE #0603270F, Electronic Warfare Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable

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

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. | (U) Preliminary design complete | Dec 1992 |
| 2. | (U) Window Coupon Test begins | Dec 1992 |
| 3. | (U) Critical design complete | Jun 1993 |
| 4. | (U) Laboratory test sensor | Dec 1994 |
| 5. | (U) Support windtunnel test | Jul 1995 |
| 6. | (U) Support flight test | Jun 1996 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603205F Budget Activity: #2-Advanced Technology Development
PE Title: Aerospace Vehicle Technology

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2506 Control of Flight | 1,900 | 3,152 | 3,978 | Cont | TBD |
| 2508 Aeromechanics/Vehicle Subsystems | 1,450 | 4,564 | 2,212 | Cont | TBD |
| 2978 Reliability and Maintainability | 4,692 | 2,686 | 4,434 | Cont | TBD |
| 3422 Cockpit Technology | 12,422 | 1,656 | 5,705 | Cont | TBD |
| Total | 20,464 | 12,058* | 16,329 | Cont | TBD |

* Difference between FY 1991 and FY 1992 reflects a Congressional reduction.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element (PE) develops and validates vehicle subsystems, flight control, cockpit, and aerodynamic technologies. Emphasis is on developing lower cost component technologies that will improve aircraft reliability and maintainability (R&M), performance and survivability of existing systems. This PE develops technologies that are an integral part of the DOD major science and technology thrusts in all weather, day/night precision strike and technologies for affordability. The FY 1992 funding increase in project 2506 in reflects the start of the electric actuator and electric brake programs. The FY 1993 funding increase in project 2978 reflects the growth of the Extended Life Tire (EXLITE) program and initiation of Vehicle Subsystems Integrity Program (VSIP). The FY 1992 funding decrease in project 3422 is the downscoping of Integrated Control/Avionics for Air Superiority (ICAAS). The FY 1993 funding increase in project 3422 reflects increased emphasis for fighter cockpit technology and standardization programs to improve cockpits, displays and display symbology.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 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. Develops electrically powered flap actuator and brake systems to eliminate a centralized hydraulic system and associated maintenance and safety problems. Develops "smart" actuator concepts utilizing computer actuation to enhance performance. Develops vehicle propulsion integration concepts to optimize vehicle performance at reduced weight, radar cross section and drag. Develops the subsystem integration technology (SUIT) concept to reduce the number of individual control boxes required in an aircraft.

Program Element: #0603205F Budget Activity: #2 - Advanced Technology Development
PE Title: Aerospace Vehicle Technology

(U) FY 1991 Accomplishments:
- (U) Completed infrared (IR) signature evaluation of thrust vectoring/reversing (TV/TR) nozzle.
- (U) Developed air vehicle interface for electric actuators.

(U) FY 1992 Planned Program:
- (U) Complete "smart" actuator flight test demonstrating integrated electronic and actuation packaging.
- (U) Develop concepts for integrated vehicle subsystem design and control functions to significantly improve reliability.
- (U) Develop design for advanced electric brakes/actuators.

(U) FY 1993 Planned Program:
- (U) Laboratory demonstration of electrohydrostatic and electromechanical actuator.
- (U) Complete Subsystem Integration Technology (SUIT) design.
- (U) Complete integration and laboratory evaluation of electric brake system.

(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, Ft Worth, TX.

(U) Related Activities:
(U) PE #0602201F, Aerospace Flight Dynamics.
(U) PE #0603216F, Aerospace Propulsion and Power.
(U) PE #0603245F, Advanced Flight Technology Integration.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2508, Aeromechanics/Vehicle Subsystems: Develops aerodynamic technology and subsystems for improved aircraft 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 and propulsion control devices for improved air vehicle flight maneuvers, a low-cost short landing capability, and the reduction/elimination of fighter aircraft vertical tails. Develops low drag, low observable (LO), external weapon carriage concepts for incorporating air-to-surface weapons on fighter aircraft. Develops integrated closed-loop environmental control system (ICECS) concepts for cockpit/avionics cooling and increased range by reducing the engine bleed air requirement.

Program Element: #0603205F Budget Activity: #2 - Advanced Technology Development
PE Title: Aerospace Vehicle Technology

(U) FY 1991 Accomplishments:
- (U) Completed low observable (LO) assessment of advanced weapons and carriage.
- (U) Completed preliminary design of the Integrated Closed-loop Environmental Control System (ICECS).

(U) FY 1992 Planned Program:
- (U) Complete wind tunnel and observability tests for innovative aero control devices for LO configurations.
- (U) Complete the ground demonstration of the redundancy and reliability of axi-nozzle for primary aircraft control.
- (U) Fabrication of (ICECS) heat exchanger and digital control design.

(U) FY 1993 Planned Program:
- (U) Select most promising innovative aero control devices for full scale ground testing.
- (U) Demonstrate 10% fuel savings advantage of the ICECS in a simulated fighter environment.

(U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright Patterson AFB, 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) PE #0602201F, Aerospace Flight Dynamics.
(U) PE #0602602F, Conventional Weapons Technology.
(U) PE #0603245F, Advanced Flight Technology Integration.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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 Integrated Environmentally Engineered Electronics (IEEE) program develops an approach to increase electronic component reliability by desensitizing the components to temperature and vibrations. The Ada Software Integrated Development/verification System (ASIDS) provides a software development tool to significantly reduce the time and cost associated with development, validation and verification (V&V) of flight critical software. The Extended Life Tire (EXLITE) program develops tire analysis, design, and testing technology to significantly improve tire life, and thus lowering life cycle cost for existing and future aircraft. The

Program Element: #0603205F Budget Activity: #2 - Advanced Technology Development
PE Title: Aerospace Vehicle Technology

Vehicle Subsystem Integrity program (VSIP) develops design and assessment concepts to reduce the high failure rate of electromechanical aircraft subsystems.

(U) FY 1991 Accomplishments:
- (U) Completed rapid prototyping of in-house, computer work station and field maintenance diagnostic tests for the Self Repairing Flight Control System (SRFCS).
- (U) Demonstrated accurate predictions in Integrated Environmentally Engineered Electronics (IEEE) for four failure modes for electronic equipment using fracture mechanics.
- (U) Completed Aircraft Battle Damage Repair wiring damage maintenance aid.

(U) FY 1992 Planned Program:
- (U) Define tire/wheel/landing gear compatibility issues for radial tire application to F-16s and other fighters.
- (U) Define system requirements for Ada Software Integrated Development Verification System (ASIDS) in flight systems.
- (U) Develop/verify Extended Life Tire (EXLITE) tire/wheel interface finite element model.

(U) FY 1993 Planned Program:
- (U) Complete ASIDS system architecture for simplified verification and validation process of flight critical control software.
- (U) Complete EXLITE F-16 Block 40 radial tire compatibility test.
- (U) Complete VSIP failure mechanism determination for selected critical components on the F-15, F-16, B-1, C-141, and C-130.

(U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright Patterson AFB, OH. The top two contractors are: Hughes Aircraft, Los Angeles, CA; and Honeywell, Minneapolis, MN.

(U) Related Activities:
(U) PE #0602201F, Aerospace Flight Dynamics.
(U) PE #0603106F, Logistics System Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 3422, Cockpit Technology: This program develops and assesses cockpit concepts. Avionics and life support technologies (fused sensor data, data links, laser protection, pilot-aiding software, etc.) are used to improve pilot performance. Cockpit design and development efforts will integrate flat panel displays with graphic processors, apply head-up (HUD) and helmet-mounted displays (HMD) where appropriate, and standardize display

symbology. The Fighter Cockpit Technology (FCT) effort will apply artificial intelligence technology, three dimensional audio, voice command, and other cockpit technologies to facilitate precision attack of fixed and mobile targets at night and in adverse weather. Methods for presenting shared, real-time intelligence information will be developed. The cockpit display symbology development and standardization effort will produce a validated (HUD) symbology set for use as a primary flight reference.

(U) FY 1991 Accomplishments:
- (U) Completed Integrated Control and Avionics for Air Superiority (ICAAS) engineering design for 2vs8 internetted simulation.
- (U) Developed detailed ICAAS simulation and flight test plans.
- (U) Completed upgraded version (medium risk) of air combat flight management system software (2vs8).
- (U) Completed preliminary design requirements for second upgrade (high risk) of air combat flight management system software (4vs16).
- (U) Fabricated two generic fighter cockpit mockups and performed in-house crew station display format experiments.

(U) FY 1992 Planned Program:
- (U) Define air-to-surface weapon delivery display format.

(U) FY 1993 Planned Program:
- (U) Define tactical air-to-surface aircraft cockpit requirements.
- (U) Define transport, and tactical aircraft cockpit mission requirements and concepts.
- (U) Define and validate head-up and head-down display symbology data for integration into applicable Military Standards.

(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.

(U) RELATED ACTIVITIES:
(U) PE #0603231F, Crew Systems and Personnel.
(U) PE #0603253F, Advanced Avionics Integration.
(U) PE #0603707E, Prototyping (Pilot's Associate Program).
(U) PE #0603245F, Advanced Flight Technology Integration.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603211F
PE Title: Aerospace Structures

Budget Activity: #2-Advanced Technology Development

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 69CW Advanced Composites | 9,075 | 10,266 | 9,850 | Cont | TBD |
| 486U Advanced Metallics | 9,075 | 9,647 | 9,297 | Cont | TBD |
| Total: | 18,150 | 19,913 | 19,147 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program in aircraft structures has been developed from the outset to be responsive to customer (MAJCOM) product needs as established by their annual program review. The overall investment strategy is to align with the specific strategic planning factors of Technology Acceleration, Technology Diffusion and Damage/Casualty Limitations. Both the metals and the composites projects address affordability by directly reducing the cost of airframe ownership through innovative structural concepts established through concurrent engineering and integrated product development (IPD) approaches. This program demonstrates advanced structural design concepts using nonmetallic (Project 69CW) and new/improved metallic (Project 486U) structures. 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 types of flight vehicle structures -- ranging from airframes to canopies to engines. The results are 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).

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

1. (U) Project 69CW, Advanced Composites: Develops and demonstrates advanced nonmetallic structures technology using fiber reinforced thermoset, thermoplastic, carbon-carbon, and ceramic materials.

(U) FY 1991 Accomplishments:
- (U) Fabricated A-10 thermoplastic trailing edge flap.
- (U) Ground tested carbon-carbon 2-D nozzle convergent flap on an advanced turbine engine.

(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.

Program Element: #0603211F Budget Activity: #2 - Advanced Technology Development
PE Title: Aerospace Structures

- (U) Complete validation test of full scale low-infrared-observable structures component.
- (U) Complete the fabrication of the major test component for the carbon-carbon hypersonic primary structure program.
- (U) Initiate the development of smart structure/skins using fiber optic based sensors for damage detection.

(U) FY 1993 Planned Program:
- (U) Complete fabrication and conduct turbine engine test on ceramic composite 2-D nozzle sidewall full scale demonstration components.
- (U) Complete payoff assessment of smart structures/skins and initiate design activities.
- (U) Fabricate and assemble the Mission Integrated Transparency System (MITS) demonstrator vehicle for maintenance testing on an F-16 aircraft.
- (U) Ground test validation of supportable radar absorbing structures for fighter aircraft.

(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; Northrop Corporation, Hawthorne, CA; General Dynamics Corporation, Ft Worth, TX; Boeing Aerospace Company, Kent, WA; Pratt & Whitney, West Palm Beach, FL; McDonnell Douglas Company, St Louis, MO; and General Electric Company, Evandale, OH.

(U) Related Activities:
- (U) PE #602102F, Materials.
- (U) PE #602201F, Aerospace Flight Dynamics.
- (U) PE #603112F, Advanced Materials for Weapon Systems.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 486U, Advanced Metallics: This project develops and demonstrates new metallic structures technology using metal matrix composites (MMC), rapidly solidified metal powders, advanced aluminum and titanium alloys, and advanced damping materials. These are used to develop innovative design concepts which transition to fielded and future flight vehicle structures to yield lower weight, greater reliability, improved survivability (ballistic/laser damage, birdstrikes, etc.), and enhanced affordability.

Program Element: #0603211F Budget Activity: #2 - Advanced Technology Development
PE Title: Aerospace Structures

(U) FY 1991 Accomplishments:
- (U) Completed ground testing of metal matrix composite (MMC) fighter vertical stabilizers to verify weight and strength advantages over current metals.
- (U) Fabricated and tested low observable (infrared attenuating) aluminum-lithium airframe subcomponent.

(U) FY 1992 Planned Program:
- (U) Analyze aircraft high energy laser survivability and vulnerability.
- (U) Complete fabrication, ground testing and evaluation of new fuselage concept "hybrid fighter structure".
- (U) Complete fabrication and conduct ground testing of elevated temperature aluminum structural components.

(U) FY 1993 Planned Program:
- (U) Complete redesign and begin fabrication of operational aircraft primary structure to extend life of aging aircraft.
- (U) Develop durable structures for applications where aft surfaces are exposed to hot exhaust and damaging acoustics.
- (U) Investigate new structural airframe designs applicable to future transport and special operations forces aircraft.
- (U) Fabricate & test lightweight titanium metal matrix composite (MMC) turbine engine disk.

(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; Northrop Aircraft Company, Hawthorne, CA; General Dynamics Corporation, Ft Worth, TX; and Pratt & Whitney, West Palm Beach, FL.

(U) Related Activities:
- (U) PE #602102F, Materials.
- (U) PE #602201F, Aerospace Flight Dynamics.
- (U) PE #603112F, Advanced Materials for Weapon Systems.
- (U) Tri-Service Metal Matrix Composite (MMC) Steering Group.
- (U) Tri-Service Laser Hardened Materials and Structures Steering Group.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603216F Budget Activity: #2 - Advanced Technology Development
PE Title: Aerospace Propulsion and Power Technology

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2480 Aerospace Fuels Technology | 818 | 970 | 1,532 | Cont | TBD |
| 2697 Atmospheric Propulsion Concepts | 8,043 | 9,054 | 5,485 | Cont | TBD |
| 3035 Aircraft Power Systems | 3,637 | 2,955 | 2,818 | Cont | TBD |
| 3036 Battery Technology | 224 | 1,035 | 675 | Cont | TBD |
| 681B Advanced Turbine Engine Gas Generator (ATEGG) | 21,860 | 28,043 | 30,280 | Cont | TBD |
| TOTAL | 34,582 | 42,057 | 40,790 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This science and technology program element ensures 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 advances include 35-60% reduction in aircraft takeoff gross weight and more than 100% range increase compared to state-of-the-art technology; a 50% increase in missile average and terminal velocity for enhanced lethality; higher temperature fuels for propulsion and thermal management; -65°F cold weather engine starting system capability; and electric aircraft power components projected to have a 2-5X improvement in reliability and maintainability, a 20% reduction in weight of aircraft power systems, and enhanced survivability.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN FY 1993:

1. (U) Project 2480, Aerospace Fuels Technology: Investigates fuel sources and quality to minimize cost and ensure adequate supplies of current and future aerospace fuels. Develops new hydrocarbon fuels with high thermal stability (JP fuels) and high heat absorbing capability (endothermic fuels) for upgraded and future aircraft and missiles. These fuels are absolutely essential to absorb the tremendous amount of waste heat generated by aircraft subsystems (engines, avionics, environmental controls, hydraulics, etc.). Additionally, such fuels will decrease maintenance of fuel system components by reducing fouling in fuel injectors and augmentor spray bars.

(U) FY 1991 Accomplishments:
- (U) Lightweight missile-scale endothermic fuel heat exchanger/ reactor designed and fabricated. It provides a 75% reduction in size and weight over current state-of-the-art technology and can process over 3 times as much fuel.

Program Element: #0603216F Budget Activity: #2 - Advanced Technology Development
PE Title: Aerospace Propulsion and Power Technology

(U) FY 1992 Planned Program:
- (U) Validate the lightweight missile endothermic fuel reactor.
- (U) Complete design of advanced endothermic fuel wall-cooled combustor/nozzle.
- (U) Complete design of large-capacity, long-life, maintainable heat exchanger/reactor for man-rated applications.

(U) FY 1993 Planned Program:
- (U) Validate endothermic fuel and wall-cooled combustor/nozzle combination that will provide 15 times more cooling capability than conventional fuel/air heat exchangers.
- (U) Fabricate reusable man-rated heat exchanger/reactor.
- (U) Fabricate endothermic fuel reactor to run in tandem with advanced missile demonstrator engine.

(U) Work Performed By: Contracts managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. Endothermic fuel reactor effort conducted under contracts to: Allied-Signal Aerospace Company's Garrett Engine Division, Phoenix, AZ; General Electric Aircraft Engines, Evendale, OH; and Pratt and Whitney, West Palm Beach, FL.

(U) Related Activities:
(U) PE #0602203F, Aerospace Propulsion.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriated Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2697, Atmospheric Propulsion Concepts: Provides assessment and demonstration of unconventional airbreathing propulsion subsystems, such as ramjets, scramjets, air turborockets, and combined cycle engines, to assure future propulsion options for missiles and high Mach vehicles. Currently, the Variable Flow Ducted Rocket (VFDR) concept is being developed as an improved propulsion system for current missile upgrades or future missile system developments. Ground test of VFDR will be completed in FY 1993; planning for flight test will begin in FY 1994.

(U) FY 1991 Accomplishments:
- (U) Demonstrated flight weight, total impulse, grain configuration, and burn rate during VFDR booster development testing.
- (U) Conducted VFDR gas generator development testing demonstrating low signature exhaust, throttle control, fuel flow rate, and integrated guidance/fuel control valve.
- (U) Determined VFDR efficiency, durability, and ramjet operability via engine performance tests.

Program Element: #0603216F Budget Activity: #2 - Advanced Technology Development
PE Title: Aerospace Propulsion and Power Technology

(U) FY 1992 Planned Program:
- (U) Complete VFDR booster and gas generator testing at simulated environmental and flight conditions.
- (U) Establish gas generator and booster final design.
- (U) Fabricate flight weight VFDR technology demonstrator engines.

(U) FY 1993 Planned Program:
- (U) Fabricate metal composite gas generator case for VFDR verification testing.
- (U) Conduct environmental characterization and performance verification testing of VFDR technologies.
- (U) Conduct transition tests to demonstrate boost-to-sustained ramjet operation at Mach 2 to verify proper mission sequencing of key VFDR propulsion system components.

(U) Work Performed By: Contracts managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The two contractors are: Atlantic Research Corporation, Gainesville, VA; and Hercules Inc, McGregor, TX.

(U) Related Activities:
(U) PE #0602203F, Aerospace Propulsion.
(U) PE #0602201F, Aerospace Flight Dynamics.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 is the more electric aircraft initiative providing a 2-5X improvement in reliability and maintainability, a 20% weight reduction, and reduced cost of ownership for aircraft power systems. This will be accomplished by replacing fluid-powered (hydraulics and bleed air) accessories with electrically-powered systems.

(U) FY 1991 Accomplishments:
- (U) Demonstrated theoretical feasibility of a fault tolerant power system for the more electric aircraft (MEA) initiative.
- (U) Rig tested high efficiency power switch for aircraft generators offering 50% increased power with double reliability.

(U) FY 1992 Planned Program:
- (U) Performance test an engine starter from -65°F to 130°F to demonstrate 500 simulated starts without refurbishment.

Program Element: #0603216F Budget Activity: #2 - Advanced Technology Development
PE Title: Aerospace Propulsion and Power Technology

- (U) Complete preliminary designs of more electric aircraft electric power distribution subsystem.
- (U) Complete detailed design of an integral starter/generator which would eliminate the need for engine and airframe mounted gearboxes which are major maintenance items.

(U) FY 1993 Planned Program:
- (U) Fabricate more electric aircraft power distribution components.
- (U) Verify built-in-test, fault sensing and isolation, and load management functions of the electrical power system.
- (U) Demonstrate integral engine starter/generator concept through both component and system testing.

(U) Work Performed By: Contracts managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The major contractors are: McDonnell Aircraft Co, St. Louis, MO; General Dynamics Co, Fort Worth, TX; General Electric, Schenectady, NY/Evendale, OH; and Northrop Corporation, Hawthorne, CA.

(U) Related Activities:
(U) PE #0602203F, Aerospace Propulsion.
(U) PE #0602201F, Aerospace Flight Dynamics.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 (more energy per volume) with improved life. A major focus is the development of a nickel-cadmium (NiCd) aircraft battery with a 20 year maintenance-free life expectancy. Current NiCd aircraft batteries require scheduled maintenance every 30-90 days. This "maintenance-free" technology will eliminate the need for flight line battery shops and overall Air Force fleet savings could approach one billion dollars for a 20 year time period due to decreased life cycle and maintenance costs.

(U) FY 1991 Accomplishments:
- (U) Established the baseline requirements for the Maintenance-Free Battery program and the development plan for future battery and charger technology efforts.

(U) FY 1992 Planned Program:
- (U) Design and develop maintenance-free battery cells with new, lower cost sealing techniques.
- (U) Characterize the charging regime to optimize the required long life of the maintenance-free battery cell.

Program Element: #0603216F Budget Activity: #2 - Advanced Technology Development
PE Title: Aerospace Propulsion and Power Technology

- (U) Design and develop the microprocessor and power components for the "smart" charger on the maintenance-free battery.

(U) FY 1993 Planned Program:
- (U) Fabricate and test flight-quality, sealed nickel-cadmium battery and charger for maintenance-free battery program.

(U) Work Performed By: Contracts managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. The contractors are: Eagle-Picher, Joplin, MO; and Eldec, Lynnwood, WA.

(U) Related Activities:
(U) PE #0602203F, Aerospace Propulsion.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

UNCLASSIFIED

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603216F
PE Title: Aerospace Propulsion and Power Technology
Project Number: 681B
Budget Activity: #2 - Advanced Technology Development

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

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Advanced Turbine Engine Gas Generator (ATEGG) | 21,860 | 28,043 | 30,280 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This science and technology project develops turbine engine gas generator technology to meet the requirements of current and 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. 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. These technologies are applicable to a wide range of military systems including aircraft, missiles, future hypersonic vehicles, land combat vehicles, and ships. This project supports the Integrated High Performance Turbine Engine Technology (IHPTET) initiative. IHPTET is a totally integrated DOD, DARPA, NASA, and industry effort focused on doubling turbine engine propulsion capabilities while reducing cost of ownership. The IHPTET program structure provides intermediate technology transition for turbine engine upgrades and derivatives.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Designed and initiated fabrication of turbojet/turbofan core gas generator which will provide a 60% improvement in thrust-to weight, a 32% reduction in fuel consumption, and a 20% reduction in life cycle cost. Technologies include brush seals, non-metallic combustor panels, and supercooled turbine technologies.
   - (U) Tested improved compressors using metal matrix composite (MMC) rotor structure and single support rotors to achieve a 10% increase in rotor speed and 10% reduction in rotor weight.

2. (U) FY 1992 Planned Program:
   - (U) Complete testing of turboprop demonstrator engine core with a 20% reduced specific fuel consumption and 40% power-to-weight improvement. Technologies include dual alloy centrifugal compressor, brush seals, and single crystal turbine blades.
   - (U) Fabricate dual annular lamilloy combustor that increases temperature capability by 500°F over baseline.
   - (U) Fabricate MMC compressor yielding 25% improvement in work per

Program Element: #0603216F
PE Title: Aerospace Propulsion and Power Technology
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stage with associated thrust-to-weight and reliability increase.
- (U) Fabricate high work turbine with a 500°F increase in rotor inlet temperature or full life capability at today's temperature levels.

3. (U) FY 1993 Planned Program:
   - (U) Complete performance demonstration of a turbofan/turbojet core with an overall 30% increase in thrust-to-weight, 23% reduction in fuel consumption, and 10% reduction in life cycle cost. Technologies include intermetallic compressor blades, brush seals in the turbine section, and magnetic bearings.
   - (U) Engine test compressors using MMC rotor structures providing a 40% reduction in weight and reduced parts count for improved reliability.
   - (U) Engine test axial staged combustors that improve cooling airflow by 70% and reduce length by 20%.
   - (U) Engine test high work turbine design that provides a 500°F improvement in temperature and a 3% reduction in blade cooling flow or full life capability at today's temperature levels.
   - (U) Continue turboprop demonstrator engine core testing demonstrating a 25% reduction in specific fuel consumption and a 60% power-to-weight improvement. Technologies include swept aerodymanic compressor, bonded single crystal turbine blades, effusion cooled combustor, and ceramic ball bearings.

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

D. (U) WORK PERFORMED BY: Contracts managed by the Aero Propulsion and Power Directorate, Wright Laboratory, Wright-Patterson AFB, OH. Contractors involved 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 1992 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) None.

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Project Number: 681B
Budget Activity: #2 - Advanced Technology Development

G. (U) RELATED ACTIVITIES:
(U) PE #0602203F, Aerospace Propulsion.
(U) PE #0602102F, Materials.
(U) PE #0602201F, Aerospace Flight Dynamics.
(U) PE #0603202F, Aircraft Propulsion Subsystem Integration.
(U) PE #0603211F, Aerospace Structures.
(U) PE #0602122N, Aircraft Technology.
(U) PE #0602234N, System Support Technology.
(U) PE #0603210N, Aircraft Propulsion.
(U) PE #0603003A, Aviation Advanced Technology.
(U) PE #0708011F, Manufacturing Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

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

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

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. | (U) Began testing of current generation Joint Technology Advanced Gas Generator (JTAGG) | Jul 1991 |
| 2. | (U) Began testing of next generation Advanced Turbine Engine Gas Generator (ATEGG) | Nov 1991 |
| 3. | (U) Complete testing of current generation JTAGG | Sep 1992 |
| 4. | (U) Begin testing of next generation JTAGG | Jan 1993 |
| 5. | (U) Begin testing of structural assessment ATEGG | Sep 1993 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603227F Budget Activity: #2 - Advanced Technology Development
PE Title: Personnel, Training, and Simulation Technology

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2743 Multi-Ship Training Research and Development | 3,996 | 5,619 | 5,911 | Cont | TBD |
| 2922 Manpower and Force Management | 1,341 | 1,725 | 1,228 | Cont | TBD |
| 2949 Advanced Training Technology | 2,559 | 2,057 | 2,450 | Cont | TBD |
| Total | 7,896 | 9,401 | 9,589 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: Demonstrates advanced 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 realistic aircrew combat training.

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

1. (U) Project 2743, Tactical Multi-Ship Aircrew Training Research: This project develops, demonstrates, and evaluates 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.

(U) FY 1991 Accomplishments:
- (U) Successfully combined eye tracking with a Fiber Optic Helmet-Mounted Display (FOHMD) to provide a high resolution visual system for air-to-ground training.
- (U) Demonstrated low-cost helmet-mounted display (HMD) to improve squadron level training.

(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 retrofitted 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) Perform simulator transfer of training for beyond visual range air combat to validate simulator use in that role.
- (U) Perform training system technology demonstration for air-to-ground training.
- (U) Demonstrate utility of a network of low-cost aircraft simulation trainers at unit level.

(U) Work Performed By: Program managed by the Armstrong Laboratory, Brooks AFB, TX. The three prime contractors are: University of

Program Element: #0603227F Budget Activity: #2 - Advanced Technology Development
PE Title: Personnel, Training, and Simulation Technology

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 Air Force 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2922, Manpower and Force Management: Manpower, personnel, and training (MPT) factors are a major player in the day-to-day productivity of the Air Force as well as the ability to operate, maintain, and support mission-capable weapon systems. This project develops technology to enhance the consideration of MPT factors early in the weapon system design and acquisition process to ensure MPT requirements are supportable, and to enable trade-offs to accommodate MPT limitations and costs. Timely consideration of these factors will reduce weapon systems development and life-cycle costs. Advanced technologies to collect and analyze MPT information and advanced development of personnel assessment technologies will contribute to improved manpower and force management.

(U) FY 1991 Accomplishments:
- (U) Built manpower requirement simulation model for use with emerging weapon systems.
- (U) Determined relationship of Air Force enlisted standards to on-the-job performance for eight Air Force specialties to assure the validity of standards.

(U) FY 1992 Planned Program:
- (U) Establish measures of effectiveness for use in evaluating the effectiveness of MPT tools and techniques.
- (U) Complete Phase III of the leadership effectiveness assessment profile (LEAP): validation and analysis.
- (U) Establish linkage of MPT databases to integrate MPT information from different sources needed to make MPT decisions.

(U) FY 1993 Planned Program:
- (U) Transfer procedures for collecting task-level job knowledge requirements to USAF Occupational Measurement Squadron for routine operational collection of data for use by training planners.
- (U) Complete productive capacity model for linking enlistment standards to job performance for Air Force Military Personnel Center to determine optimal enlistment standards.
- (U) Develop technology for automated job inventories to improve efficiency and cost-effectiveness of collecting occupational data.

(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.

Program Element: #0603227F Budget Activity: #2 - Advanced Technology Development
PE Title: Personnel, Training, and Simulation Technology

(U) Related Activities:
(U) PE 06022205F, Personnel,Training, and Simulation.
(U) PE 0604243, Manpower, Personnel, and Training Development.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2949, Advanced Training Technologies: Opportunities exist for improved job performance and readiness through the development and use of new training technologies. This project develops and demonstrates software to enable Air Force training developers to rapidly and inexpensively build intelligent computer-assisted training (ICAT) systems. ICAT systems continually interact with students to develop effective individualized training.

(U) FY 1991 Accomplishments:
- (U) Determined hardware and software requirements for cost effective and user friendly Intelligent Computer-Assisted Training (ICAT) development.
- (U) Determined which instructional strategies provide the best training in ICAT applications.
- (U) Demonstrated microcomputer authoring techniques for rapid development of intelligent tutors.

(U) FY 1992 Planned Program:
- (U) Complete the first version of Rapid Intelligent Tutoring System (ITS) Development Systems (RIDES) software for intelligent tutoring systems.
- (U) Initiate evaluation of the Avionics Job Family Tutor.
- (U) Initiate evaluation of RIDES.
- (U) Complete 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, and initiate field demonstration, test, and evaluation, including RIDES software demonstration.
- (U) Initiate development of technology to support training planning decisions to enable training planners to make optimal choices in curriculum development.
- (U) Develop advanced data collection methodologies for training planning systems for efficient, routine collection of data used in making training planning decisions.

(U) Work Performed By: Program 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 Development.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0603230F Budget Activity: # 4 - Tactical Programs
PE Title: Advanced Tactical Fighter (ATF)

A. (U) RESOURCES (S in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2472 Advanced Tactical Fighter | 303,404 | 0 | 0 | 0 | 1,107,843 |
| 2878 Advanced Tactical Fighter Engine | 417,716 | 0 | 0 | 0 | 1,894,821 |
| 2995 Critical Subsystems Development | 26,008 | 0 | 0 | 0 | 532,392 |
| Total | 747,128 | 0 | 0 | 0 | 3,535,056 |

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 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, reliability and maintainability. To develop and mature the advanced concepts and technologies required in this next-generation fighter prior to its entering Engineering and Manufacturing Development (EMD), intensive hardware demonstrations and risk reduction efforts were accomplished in a 54-month Demonstration/Validation (Dem/Val)(Prototype) phase. The Dem/Val phase was 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 was managed under three separate projects:

- Project 2472 (ATF) focused primarily on the development of the flight vehicle and related subsystems and technologies.
- Project 2878 (Advanced Tactical Fighter Engine) developed and tested advanced propulsion systems with the efficiency and reliability required for the ATF mission
- Project 2995 (Critical Subsystems Development) matured key avionics/armament technologies required to achieve ATF capability objectives with respect to situational awareness, offensive lethality, and threat warning/countermeasures.
- EMD began in August 1991 after successful Milestone II DAB. During EMD, all activities will be managed under Program Element #0604239F.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603230F
PE Title: Advanced Tactical Fighter (ATF)

Project: # 2472
Budget Activity: # 4 - Tactical Programs

POPULAR NAME: ATF

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

| BUDGET (S000) | FY 1991 | FY 1992 | FY 1993 | Program Total (To Complete) |
|---|---|---|---|---|
| Major Contract | 286,606 | 0 | 0 | 1,038,401 (0) |
| Support Contract | 0 | 0 | 0 | 0 (0) |
| In-House Support | 8,385 | 0 | 0 | 29,340 (0) |
| GFE/ Other | 8,413 | 0 | 0 | 40,102 (0) |
| Total | 303,404 | 0 | 0 | 1,107,843 (0) |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | To Complete |
| Program Milestones | Milestone II DAB July 1991 | | | |
| Engineering Milestones | | | | |
| T&E Milestones | Proto vehicle complete flight | | | |
| Contract Milestones | EMD Contract 2 Aug 1991 | | | |

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), focused on the development of the flight vehicle and related subsystems and technologies. It continued development of the next generation air superiority fighter aircraft design with the performance and survivability features required to counter the emergence of advanced fighters worldwide. 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 were demonstrated and validated. This was 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 to include fabrication and flight testing of air vehicle prototypes.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Completed prototype aircraft flight tests, data collection, and analyses.
   - (U) Completed EMD source selection and awarded airframe and engine contracts. (see PE#0604239F).

2. (U) FY 1992 Planned Program: Program completed.

3. (U) FY 1993 Planned Program: Program completed.

4. (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 were the prime weapon system contractors for the Demonstration/Validation (Dem/Val) phase. As a result of teaming agreements, Boeing and General Dynamics were principal subcontractors to Lockheed, and McDonnell Aircraft Co was the principal subcontractor to Northrop.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: None.

3. (U) COST CHANGES: S28,510 realignment within PE 0603230F.

F. (U) PROGRAM DOCUMENTATION:
- (U) TAF SON 304-83, 9 Nov 84.
- (U) TAF 304-83-I/IIA, SORD for ATF (Revision #1), 1 Mar 91
- (U) ATF TEMP, 23 Mar 91.

Program Element: #0603230F
PE Title: Advanced Tactical Fighter (ATF)

Project: # 2472
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 entered EMD and is funded under PE#0604239F (ATF Engineering).
- (U) ATF procurement will be funded under PE#0207219F (ATF).
- (U) Engineering development for ATF training systems was 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 | 3Q/FY 1991 | SUCCESSFUL |
| Wind tunnel tests | 3Q/FY 1991 | SUCCESSFUL |
| RCS Model Tests | 3Q/FY 1991 | SUCCESSFUL |
| Full scale mission simulations | 4Q/FY 1988 | SUCCESSFUL |
| Escape system qualification tests | 4Q/FY 1989 | SUCCESSFUL |
| 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

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 (S in Thousands)

| BUDGET (S000) | FY 1991 | FY 1992 | FY 1993 | Program Total (To Complete) |
|---|---|---|---|---|
| Major Contract | 417,216 | 0 | 0 | 1,816,998 (0) |
| Support Contract | 0 | 0 | 0 | 0 (0) |
| In-House Support | 0 | 0 | 0 | 0 (0) |
| GFE/ Other | 500 | 0 | 0 | 77,823 (0) |
| Total | 417,716 | 0 | 0 | 1,894,821 (0) |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | To Complete |
| Program Milestones | Milestone II DAB July 1991 | | | |
| Engineering Milestones | DDR for EMD | | | |
| T&E Milestones | Complete test First dev engine | | | |
| Contract Milestones | EMD Contract 2 Aug 1991 | | | |

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) developed and tested advanced propulsion systems for the Advanced Tactical Fighter (ATF) mission. The project sought 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 funded prototype engine demonstration of two advanced engine designs to support the flight demonstration of prototype ATF aircraft prior to Engineering and Manufacturing Development (EMD) and did the necessary development/fabrication work to protect the weapon system EMD schedule.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Completed source selection for a single EMD engine contractor in third quarter FY 1991.
   - (U) Awarded EMD engine contract in 4th Qtr of FY 1991 (see PE#0604239F).

2. (U) FY 1992 Planned Program: Program completed.

3. (U) FY 1993 Planned Program: Program completed.

4. (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, a single airframe contractor (Lockheed) and engine contractor (Pratt & Whitney) were selected for full-scale development of the ATF weapon system.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: None.

3. (U) COST CHANGES: S22,049 realignment within PE0603230F.

F. (U) PROGRAM DOCUMENTATION:
- (U) TAF SON 304-83, Nov 84.
- (U) TAF 304-83-I/IIA, SORD for ATF (Revision 1), 1 Mar 91.
- (U) ATF TEMP, 23 Mar 91.

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 Milestone II decision in July 1991, ATF entered EMD and is 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 | SUCCESSFUL |
| - General Electric | May 87 | SUCCESSFUL |
| 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 |
| 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) - N/A

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 (S in Thousands)

| BUDGET ($000) | FY 1991 | FY 1992 | FY 1993 | Program Total (To Complete) |
|---|---|---|---|---|
| Major Contract | 26,008 | 0 | 0 | 525,623 (0) |
| Support Contract | 0 | 0 | 0 | 0 (0) |
| In-House Support | 0 | 0 | 0 | 0 (0) |
| GFE/ Other | 0 | 0 | 0 | 6,769 (0) |
| Total | 26,008 | 0 | 0 | 532,392 (0) |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | To Complete |
| Program Milestones | Milestone II DAB July 1991 | | | |
| Engineering Milestones | | | | |
| T&E Milestones | Complete test AGP&AFL Demos | | | |
| Contract Milestones | EMD Contract 2 Aug 1991 | | | |

Program Element: #0603230F
PE Title: Advanced Tactical Fighter (ATF)

Project: # 2995
Budget Activity: # 4 - Tactical Programs

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

Project 2995 (Critical Subsystems Development) has helped 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 has demonstrated 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 have been sufficient to support aircraft design freeze. The state-of-the-art micro-electronics, 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 was completed in time to support an Engineering and Manufacturing Development (EMD) 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 1991 Accomplishments:
   - (U) Completed ATF Dem/Val program.
   - (U) EMD program contained in PE #0604239.

2. (U) FY 1992 Planned Program: Program completed.

3. (U) FY 1993 Planned Program: Program completed.

4. (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, rested with the prime contractors, Lockheed Aeronautical Systems Company, Burbank CA and Northrop Corporation, Hawthorne CA. Major subcontractors to the ATF primes for avionics subsystems included 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.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: None.

3. (U) COST CHANGES: S3,697 realignment within PE0603230F.

F. (U) PROGRAM DOCUMENTATION:
   - (U) TAF SON 304-83, 9 Nov 84.
   - (U) TAF 304-83-I/IIA, SORD for ATF (Revision 1), 1 Mar 91.
   - (U) ATF TEMP, 23 Mar 91.

G. (U) RELATED ACTIVITIES:
   - (U) Completed Engineering and Manufacturing Development (EMD) source selection and awarded contract see PE#0604239F).
   - (U) ATF procurement will be funded under PE #0207219F (ATF).

Program Element: #0603230F
PE Title: Advanced Tactical Fighter (ATF)

Project: # 2995
Budget Activity: # 4 - Tactical Programs

- (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 | Successful |
| Initial avionics prototype core demonstrations | 1Q/FY 1989 | Successful |
| Begin flying AFL demonstrations | 4Q/FY 1989 | Successful |
| Final avionics prototype demonstrations | 4Q/FY 1990 | Successful |
| Test bed demonstrations | 4Q/FY 1990 | Successful |

T&E ACTIVITY (TO COMPLETION) N/A

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2722 Aerospace Chemical Warfare Defense | 4,419 | 3,837 | 4,007 | Cont | TBD |
| 2829 Crew-Centered Cockpit Design | 4,549 | 4,256 | 4,216 | Cont | TBD |
| 2830 Advanced Life Support | 2,547 | 2,076 | 2,715 | Cont | TBD |
| 2868 Crew Escape Systems | 1,988 | 2,493 | 2,635 | Cont | TBD |
| 2992 Space Crew Enhancement | 355 | 773 | 0 | Cont | TBD |
| 3257 Helmet-Mounted Systems Technology | 4,336 | 4,907 | 4,476 | Cont | TBD |
| Total | 18,194 | 18,342 | 18,049 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program conducts advanced development of concepts, components, and systems to protect and enhance the performance of Air Force personnel in operational environments. Specific projects advance and integrate human factors technologies into cockpit, life support, and aircrew equipment designs. Demonstrated technologies will feed into engineering and manufacturing development programs to address over fifteen documented needs from USAF commands which require these specific warfighting capabilities.

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

1. (U) Project 2722, Aerospace Chemical Warfare Defense: This project develops technology to protect Air Force personnel as they perform their duties during operational situations. The goal is to maintain sortie generation rates and effectively treat casualties in any type of combat environment. In conjunction with Army efforts, this project meets documented Air Force requirements for operations in chemical/biological environments. Emphasis is on the development of tools to help both researchers and weapon system operators assess the operational impact of the threat with and without current and projected chemical/biological defensive and protective measures.

(U) FY 1991 Accomplishments:
- (U) Developed Threat Related Attrition (THREAT) computer models to study chemical and General Purpose Munitions effects on protected/unprotected structures.
- (U) Studied concept of using a computer model to identify front line Wartime Medical (WARMED) requirements.

(U) FY 1992 Planned Program:
- (U) Develop WARMED computer model to determine amount of medical resources required at First and Second Echelon facilities as a function of contingency scenario.
- (U) Develop THREAT computer models incorporating effects of air-to-surface explosives on facilities, and of disease, non-battle injuries, and combat stress on combat forces.

(U) FY 1993 Planned Program:
- (U) Complete development of databases for THREAT model to support analysis of possible contingencies world-wide.

Program Element: #0603231F Budget Activity: #2 - Advanced Technology Development
PE Title: Crew Systems and Personnel Protection Technology

- (U) Complete WARMED Theater Model to simulate the Air Force wartime medical system during theater specific threat conditions identified during from the THREAT model.
- (U) Develop attrition analysis models to determine resupply requirements for theater and installation ground attacks.

(U) Work Performed By: Program managed by Human Systems Program Office (HSD/YA), Human Systems Division (AFSC), Brooks AFB, TX. Cooperative efforts with Armstrong Laboratory, Uniformed Services University for Health Sciences, and Phillips Laboratory. Major contractor is BDM International, McLean, VA.

(U) Related Activities:
(U) PE #0602202F, Human Systems Technology.
(U) PE #0604703F, Aeromedical/Chemical Defense Systems Development.
(U) PE #0604601F, Chemical Defense Equipment.
(U) The Army is DOD lead for chemical warfare defense.
(U) Multi-Service applications identified in the Joint Service R&D and Acquisition Plan for Chemical Warfare Defense.
(U) Medical chemical defense research is coordinated with Armed Services Biomedical Research Evaluation and Management Committee.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2829, Crew-Centered Cockpit Design: Past and present cockpits were developed to meet the constraints of the aircraft. Decisions on where to place flight instruments and controls were often based on item's size, weight, or traditional location. Information or tradeoff studies supporting these decisions usually were not saved. The goal of this project is to develop a crew system design and development process which will address the human factors requirements of the crew station early in the aircraft acquisition cycle. This will be a "traceable" process so that future weapon system designers will understand the rationale behind design decisions; e.g., location of flight instruments. Tools developed will predict pilot performance and mission success as functions of cockpit design to quantify human/system trade-offs.

(U) FY 1991 Accomplishments:
- (U) Completed formal Crew System Design Process to help designers assess cockpit requirements.
- (U) Installed computer-aided engineering/computer-aided design analysis software at the DoD Crew Systems Information Center to provide demonstrations and training on tools developed for use in cockpit design and modification.

(U) FY 1992 Planned Program:
- (U) Initiate development of an in-flight cockpit evaluation system to measure pilot workload and performance.
- (U) Install complete computer-based (hardware and software) cockpit design support system to demonstrate and validate cockpit design process and design support system procedures and techniques used to design, develop, and modify new and existing cockpits.

Program Element: #0603231F Budget Activity: #2 - Advanced Technology Development
PE Title: Crew Systems and Personnel Protection Technology

(U) FY 1993 Planned Program:
- (U) Demonstrate cockpit design process for tactical and transport aircraft to develop cockpits designed to meet the requirements of the aircraft's mission.
- (U) Begin evaluations for upgrades to current cockpit designs to develop a system for measuring cockpit effectiveness in terms of mission, safety, and pilot awareness.

(U) Work Performed By: Program managed by the Armstrong Laboratory, Brooks AFB, TX, with oversight by the Joint Cockpit Office, Wright Patterson AFB, OH. Tests to verify software and procedures are being performed by the Defense Logistics Agency, Air Force Aeronautical Systems Division, Wright Laboratory, and Armstrong Laboratory. Contractors are: Veda Inc., Dayton, OH; and Boeing Military Airplanes, Seattle, WA.

(U) Related Activities:
(U) PE #0602202F, Human Systems Technology.
(U) PE #0603205F, Aerospace Vehicle Technology - Agreement matrixes manning for integration of pilot/vehicle interface technologies and simulation capabilities.
(U) Laboratory Joint Cockpit Office administers Armstrong Laboratory and Wright Laboratory advanced programs in cockpit technology.
(U) Coordination occurs through a Crew Station Working Group within Air Force Systems Command. Also through a Joint Aeronautical Commander's Group Committee, and DOD Human Factors Engineering Technical Group.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2830, Advanced Life Support: This project develops and integrates advanced aircrew life support subsystems. The goal is to improve aircrew combat performance while protecting the aircrew from physiological stresses: high altitudes; high G-forces; electro-magnetic threats; thermal burden; and ballistic injury. This project demonstrates high altitude protection and improved G-protection.

(U) FY 1991 Accomplishments:
- (U) Evaluated pilot performance and G-tolerance when using positive pressure breathing system (COMBAT EDGE) for G-protection integrated with chemical defense.
- (U) Completed concept study which identifies ability to develop battlefield eye protection compatible with life support equipment and day/night operations.

(U) FY 1992 Planned Program:
- (U) Initiate flight evaluation of advanced tactical anti-G suit; goal is 30% improvement in G-endurance.
- (U) Initiate development of advanced vision protection system; incorporate laser protection with nuclear flashblindness, and conventional glare and dust protection.

Program Element: #0603231F Budget Activity: #2 - Advanced Technology Development
PE Title: Crew Systems and Personnel Protection Technology

(U) FY 1993 Planned Program:
- (U) Complete advanced development of an aircrew spectacle safety frame for corrective eyeglasses that is compatible with current life support equipment.
- (U) Initiate development of full pressure suit for personal transatmospheric protection; demonstrate gloves which are expected to operate at a pressure differential 25% greater than current gloves.
- (U) Transition advanced technology anti-G suit to engineering development for planned product improvement to COMBAT EDGE -- added technology will increase pilot G-endurance.

(U) Work Performed By: Program managed by the Armstrong Laboratory, Brooks AFB, TX. The contractors are: Boeing Advanced Systems, Seattle, WA; ILC Dover, Dover, DE; Krug International, San Antonio, TX; Battelle Memorial Institute, Columbus, OH; and Systems Research Laboratories, San Antonio, 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 2868, Crew Escape: This project develops and demonstrates advanced technology subsystems to be integrated into an ejection seat capable of protecting aircrew throughout as much as possible of the performance envelope of military aircraft. The goal is to reduce fatalities and major injury rates in emergency ejections at air speeds up to 700 Knots Equivalent Airspeed and at adverse attitudes. Technology developed will also improve ejection seat reliability, maintainability, and logistics supportability.

(U) FY 1991 Accomplishments:
- (U) Performed windtunnel test to develop windblast protection subsystems to reduce injuries that may occur to the pilot immediately after ejection.
- (U) Completed concept study of haulback/restraint system -- properly positions pilot as first step in an ejection.

(U) FY 1992 Planned Program:
- (U) Establish requirements of next generation ejection seat to ensure pilots who must eject are able to land safely.
- (U) Develop haulback/restraint subsystem -- reduce time required to position upper torso in seat from 300 to 150 milliseconds prior to ejection.

(U) FY 1993 Planned Program:
- (U) Integrate haulback/restraint and windblast protection subsystems with other ejection seat subsystems.
- (U) Integrate thrust vector control (TVC) propulsion with an actuator system to maneuver ejection seat away from impact with the ground during an adverse attitude ejection.

Program Element: #0603231F Budget Activity: #2 - Advanced Technology Development
PE Title: Crew Systems and Personnel Protection Technology

(U) Work Performed By: Program managed by Armstrong Laboratory, Brooks AFB, TX. In-house development and testing by the Armstrong Laboratory and Wright Laboratory, Wright-Patterson AFB, OH. Major contractors are: Frost Engineering, Englewood, CO; and Rockwell International, Los Angeles, CA.

(U) Related Activities:
(U) PE #0602202F, Human Systems Technology.
(U) PE #0604706F, Life Support Systems.
(U) PE #0603269F, National Aero-Space 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 2992, Space Crew Enhancement (SPACE): This project identifies and develops specialized crew protection and man-machine integration needed to support possible military missions from space. The goal is to develop the database required to identify possible mission scenarios, crew capabilities, and military unique crew requirements.

(U) FY 1991 Accomplishments:
(U) Evaluated ground-target acquisition and tracking system for the space shuttle to assess man's ability to track ground targets from low earth orbit.

(U) FY 1992 Planned Program:
- (U) Initiate development on ensemble subsystems (gloves and joints) for transatmospheric operations.
- (U) Transfer remaining transatmospheric and high altitude protection suit technology to Project 2830, Advanced Life Support; work will support existing studies to improve personal protection.

(U) FY 1993 Planned Program: Not Applicable.

(U) Work Performed By: Program managed by the Armstrong Laboratory, Brooks AFB, TX. Contractors are: Systems Research Laboratory, Beavercreek, OH; and Rockwell International, Los Angeles, CA.

(U) Related Activities:
(U) PE #0602202F, Human Systems Technology.
(U) PE #0604706F, Life Support Systems.
(U) PE #0603269F, National Aero-Space Plane
(U) Military space crew activities coordinated through Military/NASA Space Technology Interdependency Group.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 to improve pilot

Program Element: #0603231F Budget Activity: #2 - Advanced Technology Development
PE Title: Crew Systems and Personnel Protection Technology

situational awareness. These displays use sight and sound so the pilot interacts with the world in a natural, intuitive manner during day or night operations and in adverse weather conditions. Possible future applications include an all-aspect, fire control system which will allow the pilot, just by turning his head, to use the full capability of his air-to-air and air-to-surface weapons. This work supports requirements for a head-steered forward looking infrared radar (FLIR) and for improved night vision goggles.

(U) FY 1991 Accomplishments:
- (U) Completed concept evaluation of the Interim Night Integrated Goggle Head Tracking System (I-NIGHTS) demonstrating capability to integrate night vision with helmet-mounted head-up display (HUD) technologies.
- (U) Completed ground test evaluations of low profile night vision goggles for potential use in ejection-compatible aircraft -- information will be used to reduce risk during design of ejection-compatible systems.

(U) FY 1992 Planned Program:
- (U) Demonstrate in-flight I-NIGHTS to improve pilot ability to acquire targets during night operations.
- (U) Continue development of High Voltage Quick Disconnect for application in future helmet mounted display systems to reduce risks during ejection and emergency ground egress.
- (U) Study concept of ejection-compatible wide field-of-view night vision system; demonstrate 60 degree field-of-view capability, a 20 degree improvement over current model.

(U) FY 1993 Planned Program:
- (U) Begin development of Binocular Helmet Display (BHMD) to incorporate 3-D Audio Localization, Laser Protection, Active Noise Reduction, and low power/high resolution display technologies with ejection compatibility.
- (U) Flight test Concept VI Aircrew Night Vision System -- demonstrate reduced ejection risk, increased field-of-view, and higher resolution over current model.
- (U) Evaluate subsystem technologies to increase the field-of-view, situational awareness, eye protection, and symbology generation to be applied to BHMD development.

(U) Work Performed By: Program managed by the Armstrong Laboratory, Brooks AFB, TX. Contractor is McDonnell Aircraft Company, St. Louis, MO.

(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603238F
PE Title: Global Surveillance & Communications/Air Superiority & Defense/ Precision Strike Technology Demonstrations
Project Number: 4185
Budget Activity: #2-Advanced Technology Development

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

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Near-Real-Time Targeting | 0 | 0 | 25,000 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
This program element develops and demonstrates the technology required to perform targeting, attack, and weapon delivery of tactical and strategic weapons in real-time utilizing both onboard and offboard assets. This program will perform technology demonstration efforts to develop an easily reprogramable targeting system applicable to strategic and tactical systems. Utilizing multiple sensors, such as advanced micro/millimeter wave and ladar technology to develop three-dimensional imagery, this program will explore the potential to perform bomb damage assessment (BDA) in real-time so as to give aircraft the capability during egress to return to the target zone. Upgrade navigation checkpoint sensors to quality needed for target recognition and BDA. The responsive aircraft targeting system using stored reference data will be capable of making real-time/onboard adjustments to the mission execution process so that all or part of the mission objectives may still be accomplished. It will also be able to respond to new information including revised mission instructions from command and control structures, updated target or threat locations from offboard sources, or significant change in platform capabilities resulting from partial equipment failure, battle damage, weather, etc. This program will link technology to allow the accurate secure transmission of targeting information from sensor to shooter, development of integrated active and passive sensor technology for long range threat detection and targeting, and model-based vision approaches to identify ground-based targets in real-time while reducing the overall operator workload. This program element supports the DoD thrust initiatives for Advanced Technology Demonstrations for Precision Strike and Global Surveillance & Communications.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Not Applicable.

2. (U) FY 1992 Planned Program:
   - (U) Not Applicable.

Program Element: #0603238F
PE Title: Global Surveillance & Communications/Air Superiority & Defense/ Precision Strike Technology Demonstrations
Project Number: 4185
Budget Activity: #2-Advanced Technology Development

3. (U) FY 1993 Planned Program:
   - (U) Transition the automatic target recognition high resolution synthetic aperture radar technology (developed under PE 0603253F) into operational processors for ground-based demonstrations.
   - (U) Fabricate targeting system capable of detecting threats in a camouflaged, concealed, and deception environment.
   - (U) Design and develop a demonstration for efficient pointing/scanning of multiple target search and identification sensors to provide maximum coverage of most likely target deployment areas.
   - (U) Develop capability for rapidly reprogramable, updated signatures of both threat and friendly targets.
   - (U) Investigate sensitivity of BDA quality to sensor resolution for a variety of target types and weapons effects.
   - (U) Explore adaptation of automatic target tecognition (ATR) technology to automation of BDA function.
   - (U) Define communication/asset internetting capability baselines which document communications data transfer limitations to support real-time data linking of hunter, shooter, weapon assets.
   - (U) Determine data transfer requirements and communication/data link options for real-time internetting of hunter/shooter/weapon systems.

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

D. (U) WORK PERFORMED BY: Wright Laboratory, Wright Patterson AFB, OH, will manage this project. This is a new project that begins in FY 1993, therefore, there are no major contractors at this time.

E. (U) COMPARISON WITH FY 1992 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) Not Applicable.

G. (U) RELATED ACTIVITIES:
   (U) PE 0602204F, Aerospace Avionics.
   (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
   (U) PE 0603253F, Advanced Avionics Integration.
   (U) PE 0603238N, Air Defense/Precision Strike Technology Demonstration.

Program Element: #0603238F Project Number: 4185
PE Title: Global Surveillance & Communications/Air Superiority & Defense/ Precision Strike Technology Demonstrations
Budget Activity: #2-Advanced Technology Development

(U) PE 0603238A, Air Defense/Precision Strike Technology Demonstration.
(U) This project has been coordinated and fully integrated with Army, Navy, Air Force, and DARPA plans to insure nonduplication and compatibility with the integrated demonstrations.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

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

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

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. | (U) Demonstrate real-time ATR capability. | 2Q FY 1994 |
| 2. | (U) Demonstrate hunter/shooter datalink. | 3Q FY 1996 |
| 3. | (U) Demonstrate real-time, operationally reprogrammable threat data base. | 3Q FY 1996 |
| 4. | (U) Conduct adverse weather demonstration of integrated active/passive reprogrammable targeting sensor. | 4Q FY 1997 |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2061 Avionics Technology Integration | 17,248 | 6,558 | 9,987 | Cont | TBD |
| 2568 Air Vehicle Technology Integration | 1,970 | 1,470 | 1,703 | Cont | TBD |
| 2682 Propulsion Technology Integration | 3,222 | 1,843 | 5,028 | Cont | TBD |
| 2979 Weapons Technology Integration | 418 | 302 | 2,017 | Cont | TBD |
| Total | 22,858 | 10,173* | 18,735 | Cont | TBD |

* Difference between FY 1991 and FY 1992 reflects a Congressional reduction.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element accomplishes the integration function and conducts advanced technology transition demonstrations (ATTDs) to improve the performance and supportability of existing, as well as future aircraft. The system level integration brings together the air vehicle technologies with avionics, propulsion and weapons systems to flight demonstration in a realistic operational environment. The integration and flight test constitute rapid prototyping to reduce the risk and time required to transition technologies into operational aircraft. This program element is an integral part of the DOD major science and technology thrusts in all weather, day/night precision strike and technologies for affordability. The funding decrease in FY 1992 in project 2061 reflects cancellation of the flight test, and reduced simulation tasking prior to termination of the Integrated Control/Avionics for Air Superiority (ICAAS) program. The funding increase in FY 1993 in project 2682 is the start-up of the joint NASA/USAF Propulsion Aerodynamics Control Integration Research (PACIR) program. The FY 1993 funding in project 2979 reflexes the start-up of the joint precision strike program to integrate and demonstrate technology developments required to bring together the air vehicle, pilot, weapon and avionics into total systems with the necessary accuracy for precision strike.

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

1. (U) Project 2061, Avionics Technology Integration: This project provides the integration of avionics technologies with aircraft and flight demonstration in an operational environment. This project includes the integration and flight demonstration of avionics and cockpit technologies for transports and a joint program with avionics for multiple target attack. This technology program addresses the friendly versus enemy fighter air-to-air engagements. The design goals are to achieve a projected 25% increase in fighter air-to-air combat engagement effectiveness.

Program Element: #0603245F Budget Activity: #2 - Advanced Technology
PE Title: Advanced Flight Technology Integration (AFTI) Development

This program also integrates and flight demonstrates technologies to enhance ground attack capability for existing aircraft. 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 transport aircraft cockpit programs meet urgent user command needs for cockpit technology advancements by applying crew-vehicle integration techniques through simulation and flight test demonstrating reductions in crew workload and improvements in weapon system performance. The transport aircraft cockpit effort will demonstrate a common pilot/vehicle interface for theater resupply. Covert penetration, threat detection/avoidance, and autonomous operations are fundamental design drivers.

(U) FY 1991 Accomplishments:
- (U) Completed ICAAS software integration and primary aircraft modification and checkout.
- (U) Flight tested AFTI F-16 integrated hardware/software for single seat fighter automation (includes under the weather night attack, terrain following, and threat avoidance technologies).

(U) FY 1992 Planned Program:
- (U) Complete ICAAS 2vs8 simulations.
- (U) Complete the transport aircraft crew systems design and test plan.
- (U) Integrate and flight test advanced Forward Looking Infrared (FLIR) on the AFTI F-16 (assuming planned augmentation).

(U) FY 1993 Planned Program:
- (U) Complete the transport aircraft cockpit integration and checkout.
- (U) Complete simulations and terminate ICAAS program.
- (U) Complete AFTI F-16 analysis and flight reports.

(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.

(U) Related Activities:
(U) PE #0603205F, Aerospace Vehicle Technology.
(U) PE #0604212F, Aircraft Equipment Development.
(U) PE #0603231F, Crew Systems Technology.
(U) PE #0603253F, Advanced Avionics Integration.
(U) PE #0603707E, Prototyping (Pilot's Associate program).
(U) PE #0603737D, Balanced Technology Initiative (BTI).
(U) PE #0603269F, National Aerospace Plane (NASP).
(U) PE #0603363F, Armament Technology Integration.

Program Element: #0603245F Budget Activity: #2 - Advanced Technology
PE Title: Advanced Flight Technology Integration (AFTI) Development

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2568, Air Vehicle Technology Integration: This project provides the integration and flight demonstration of aeromechanics, flight control, and vehicle subsystems technologies into an aircraft for operational evaluation for advanced technology transition demonstration. Includes the NASA/AF Hybrid Laminar Flow Control (HLFC) program which is evaluating aircraft cruise range and fuel savings improvements using leading edge suction to maintain smooth air flow over the wing, which improves maneuverability during combat, and increases range and fuel efficiency at cruise speeds. This project leverages USAF funds with NASA to demonstrate and test the military utility of advanced aircraft maneuvering technologies.

(U) FY 1991 Accomplishments:
- (U) Completed HLFC flight test data analysis and transitioned results to technical community.

(U) FY 1992 Planned Program:
- (U) Design, fabricate, and flight test device to control the flow over the aircraft nose to improve high angle of attack, safety, and stability utilizing the X-29 test bed.

(U) FY 1993 Planned Program:
- (U) Design vortex flow control device for flight testing on an F-16 to improve high angle of attack aircraft control.

(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2682, Propulsion Technology Integration: Integrates flight control with the propulsion system (inlet, engine and nozzles) within a fault tolerant architecture to achieve improved aircraft performance. The F-15 Short Takeoff and Landing/Maneuver

Program Element: #0603245F Budget Activity: #2 - Advanced Technology
PE Title: Advanced Flight Technology Integration (AFTI) Development

Technology Demo (STOL/MTD) program integrates and flight tests pitch axis thrust vectoring/reversing (TV/TR) exhaust nozzles, integrated flight and nozzle control, 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 capacity (day or night) to land on short runways without the aid of ground-based equipment. The Propulsion Aerodynamics Control Integrated Research (PACIR) effort will utilize a full authority digital engine control (FADEC), Multi-Axis (pitch and yaw) Thrust Vectoring (MATV) nozzles, fault tolerant system architectures, and reconfiguration strategies to improve aircraft performance, range, and engine life. This integration task is directed at all current aircraft. Objective is to reduce maintenance costs while increasing range by reducing aircraft weight and overall drag.

(U) FY 1991 Accomplishments:
- (U) Completed IR signature evaluation of TV/TR nozzle and transitioned results to technical community.
- (U) Completed the F-15 STOL/MTD program.

(U) FY 1992 Planned Program:
- (U) Complete benefit analysis of integration of flight/propulsion control program for PACIR.

(U) FY 1993 Planned Program:
- (U) Complete preliminary design of integrated fault-tolerant flight/propulsion control for PACIR.
- (U) Accomplish wind tunnel testing of jet effects and advanced aerodynamic control devices for PACIR.
- (U) Perform initial piloted simulation of PACIR.

(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 #0603216F, Aerospace Propulsion and Power.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 2979, Weapons Technology Integration: This project integrates weapons with the air vehicle technologies to optimize precision strike of high value enemy targets. Emphasis is on the integration of sensor targeting and pilot interaction to acquire and kill time critical mobile and hard targets in adverse weather.

Program Element: #0603245F Budget Activity: #2 - Advanced Technology
PE Title: Advanced Flight Technology Integration (AFTI) Development

Integration of weapons includes physical integration as well as functionally controlling (arming and releasing) the weapons. Air vehicle performance (observability, maneuverability and speed) should not be degraded nor should any of the air vehicle subsystems be adversely affected. The Self-Repairing Flight Control System (SRFCS) was a Reliability and Maintainability Program that was completed in FY 1992. The SRFCS program demonstrated software for flight control system reconfiguration and in-flight diagnostics developed under PE 0603205F.

(U) FY 1991 Accomplishments:
- (U) Completed flight test analysis and report for SRFCS single surface reconfiguration demonstration.

(U) FY 1992 Planned Program:
- (U) Transition SRFCS maintenance diagnostics system to Integrated Maintenance Information System (IMIS).

(U) FY 1993 Planned Program:
- (U) Definition of air vehicle requirements for design and flight testing of air-to-ground precision strike of time critical targets (mobile and fixed) attack system integration into existing aircraft.

(U) Work Performed By: This project is managed by the Wright Laboratory, Flight Dynamics Directorate, Wright-Patterson AFB, OH. The primary contractors are: General Dynamics, Ft Worth TX; and McDonnell Douglas Co., St Louis, MO.

(U) Related Activities:
(U) PE #0603601F, Conventional Weapons.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603250F Project Number: 649L
PE Title: Lincoln Laboratory Budget Activity: #2-Advanced Technology Development

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

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Lincoln Laboratory | 25,846 | 26,719 | 26,686 | 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 Massachusetts Institute of Technology (MIT). 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 the areas of military satellite communications, space radar technology, space-based visible surveillance, deep-space and tactical battlefield surveillance, 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 1991 Accomplishments:
   - (U) Demonstrated platinum silicide (PtSi) Schottky-barrier and germanium-silicon (GeSi-Si) heterojunction infrared (IR) detector arrays (400x400 pixels) for space surveillance.
   - (U) Demonstrated generic 2-layer charge coupled device (CCD) neural network chips for automated image recognition processing tasks.
   - (U) Developed diode laser amplifiers and oscillators with 1 watt continous wave (CW) diffraction-limited beams for laser communications.
   - (U) Industry has adopted the nitrated oxide gate dielectric for submicron devices developed by Lincoln Laboratory.
   - (U) Incorporated a 64-pixel photoreceptor array with background light adaptation into a demonstration camera.
   - (U) Demonstrated an automatic reentry vehicle recognition program which operates in real time.
   - (U) Demonstrated 1 watt optical power amplifier.
   - (U) Demonstrated 3 gigabits per second (Gbps) heterodyne optical communications link.
   - (U) Demonstrated non-linear optical multi-mode heterodyne receiver.
   - (U) Developed initial lar ultra violet-visible-infrared (UV-VIS-IR) images for space d missile surveillance unmanned air vehicle (UAV).

Program Element: #0603250F Project Number: 649L
PE Title: Lincoln Laboratory Budget Activity: #2-Advanced Technology Development

- (U) Upgraded UAV radar processor to implement 3-meter resolution strip map synthetic aperture radar (SAR) mode, adding to moving-target detection mode.
- (U) Evaluated airborne active/passive sensor for detection of tactical and strategic targets in foliage and camouflage.

2. (U) FY 1992 Planned Program:
   - (U) Demonstrate charge coupled device (CCD) chips for visible and ultraviolet imaging with greater than one million pixels, radiation hardened to 1 Mrad.
   - (U) Improve quantum efficiency of GeSi-Si heterojunction detectors and develop integrated silicon microlens arrays to increase sensitivity.
   - (U) Increase the processing capacity of CCD neural network chips to $10^{10}$ operations-per-second for automated image processing.
   - (U) Fabricate arrays of integrated electronic and optical components for implementation of early-vision neural network.
   - (U) Develop and demonstrate signal-distribution structures for compact millimeter wave (MMW) circuits using multiple superconductive and insulating layers.
   - (U) Demonstrate multichip module using pluggable chips.
   - (U) Demonstrate full shared memory operation of reduced instruction set computater (RISC) clusters coupled by 1 gigabits per second (Gbps) optical free-space interconnections.
   - (U) Develop 1 Gbps error correction coder/decoder application specific integrated circuit (ASIC).
   - (U) Develop space-qualified optical fiber nutator and heterodyne receiver front-end.
   - (U) Demonstrate advanced visible infrared focal plane arrays (VIS/IR FPAs) in experimental sensors at the eastern test site (ETS).
   - (U) Design third-generation UAV radar processor to support formation of high-resolution (1-ft) real-time SAR images.
   - (U) Develop direction-finding and copy algorithms which exploit waveform features to improve accuracy.

3. (U) FY 1993 Planned Program:
   - (U) Develop & demonstrate large multichip multi-megapixel focal plane arrays optimized for VIS/UV space surveillance.
   - (U) Embed CCD neural network chips into neural network signal processor.
   - (U) Demonstrate opto-electronic implementation of subsystem of early-vision neural network.
   - (U) Demonstrate coupled arrays of cw diode lasers with 10 W cw power.
   - (U) Demonstrate two- and three-terminal high-temperature thin-film superconductive devices for high-speed signal processing.
   - (U) Design a gate array to encode/decode 5 Gbps message data and to control all functions for an optical ring network.

Program Element: #0603250F Project Number: 649L
PE Title: Lincoln Laboratory Budget Activity: #2-Advanced Technology Development

- (U) Test end-to-end the Laser Intersatellite Experiment (LITE) engineering model.
- (U) Develop adaptive coherent receiver for high-speed optical downlink.
- (U) Develop fiber-coupled transmit laser module.
- (U) Develop and demonstrate low-noise medium wave infrared red and long wave infrared red (MWIR/LWIR) detector arrays operating out to 10 microns wavelength for space surveillance.
- (U) Use knowledge of interferer waveform features to improve direction-finding accuracy for the signal-of-interest.

4. (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 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNOLOGY CHANGES: Not Applicable.
2. (U) SCHEDULE CHANGES: Not Applicable.
3. (U) COST CHANGES: Not Applicable.

F. (U) PROGRAM DOCUMENTATION:
- (U) MIT Lincoln Laboratory FCRC Charter, 1951.
- (U) DOD plan for Administration of Lincoln Laboratory, May 1975.

G. (U) RELATED ACTIVITIES:
(U) PE 0303603F, Milstar.
(U) PE 0602702F, Command, Control and Communications.
(U) PE 0102424F, Space Track.
(U) PE 0102428F, Space Surveillance Technology.
(U) PE 0303401F, Communications Security.
(U) PE 0601102F, Defense Research Science.
(U) PE 0601101E, In-House Laboratory Research.
(U) PE 0602301E, Wafer-Scale Integration.
(U) PE 0603789F, Command, Control, Communications and Intelligence.
(U) This project has been coordinated through the Project Relience process to harmonize efforts and eliminate duplication.

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

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

J. (U) MILESTONE SCHEDULE: Not Applica .

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 666A Advanced Reference Systems Development | 2,538 | 2,978 | 3,490 | Cont | TBD |
| 2733 Advanced Reconnaissance/Strike Radars | 6,873 | 6,612 | 8,722 | Cont | TBD |
| 2735 Advanced Systems Avionics Applications | 2,849 | 3,649 | 8,865 | Cont | TBD |
| 3833 Sensor Integration for Covert Penetration | 3,082 | 3,291 | 3,599 | Cont | TBD |
| Total | 15,342 | 16,530 | 24,676 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element develops technology to improve radar and navigation systems performance, improve avionics supportability and integration, and apply these and other technologies to improving mission operations. For example, the radar project is studying motion compensation techniques that address the documented problem of image smearing in synthetic aperture radar (SAR) during turbulent flight conditions. Currently, 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 improving capabilities of 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 Pave Pillar, the predecessor of the Joint Integrated Avionics Working Group common avionic baseline for Advanced Tactical Fighter/Light Helicopter. This project 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 to improve the capabilities of aircraft to penetrate hostile airspace. Additional FY 1993 funding of $5,000 was added to develop adaptive processing for infrared search and track systems and information fusion with other sensor sysytems for real-time display to the pilot.

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

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 1991 Accomplishments:
- (U) Laboratory tested anti-jam Global Positioning System breadboard receivers to quantify improved electronic counter-countermeasure capability. Demonstrated 25 dB anti-jam margin.
- (U) Completed 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) 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) Design an ultra-high reliability inertial measurement unit 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; Northrop, 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 1991 Accomplishments:
- (U) Combined model-based vision algorithms with parallel processing to enable synthetic aperture radar automatic target recognition (ATR) capability.
- (U) Tested 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) 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 test adverse-weather, near real-time target recognition capability.
- (U) Fabricate and test a flyable wide area, air-to-surface search and cueing radar brassboard capable of reliably detecting hidden/camouflaged relocatable targets such as Scuds.
- (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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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, which is the sharing of common assets among distributed functions. This project focuses 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 aerospace vehicles with affordable high speed signal processing.

(U) FY 1991 Accomplishments:
- (U) Completed technology assessment to define avionics technology development plan for integrated sensors, parallel processing, photonics, and real-time software transitions into aircraft.

Program Element: #0603253F Budget Activity: #2-Advanced Technology Development
PE Title: Advanced Avionics Integration

- (U) Built and laboratory tested a time stress measurement module to collect environmental stress information to enable real-time fault detection and isolation in modular avionics.

(U) FY 1992 Planned Program:
- (U) Begin design of ultra-reliable digital and radio frequency (RF) with failure-free operating time increased by an order of magnitude over current digital and RF avionics systems.
- (U) Evaluate performance of Air Force avionics-applications algorithms using DARPA's ALADDIN high speed 32 bit processor module.

(U) FY 1993 Planned Program:
- (U) Complete design of an ALADDIN-class supercomputer re-packaged in a Joint Integrated Avionics Working Group (JIAWG) - compatible standard format (SEM-E) to meet fighter requirements for advanced avionic subsystems.
- (U) Design ultra-reliable RF modules to improve life-cycle cost of fighter radar phased array antennas.
- (U) Design specifications to provide JIAWG compatible modular and shareable resources to support low cost implementation of integrated sensor technologies.
- (U) Deliver a real-time artificial intelligence system brassboard to augment DARPA Pilot's Associate in adding capabilities such as automatic target recognition.
- (U) Demonstrate high speed gallium arsenide sensor preprocessor to improve status reporting to the aircrew.
- (U) Develop adaptive processing technology for incorporation into an advanced Infrared Search Track sensor that will then be integrated into an avionics suite for evaluation.

(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 presence of the aircraft. These emissions limit covert penetration. This project supports laboratory demonstration and

Program Element: #0603253F Budget Activity: #2-Advanced Technology Development
PE Title: Advanced Avionics Integration

flight test of the system technologies to provide current and future airborne weapon systems with significant new capabilities to penetrate areas without being detected. Efforts concentrate on nap-of-the-earth flight in day or night, integrating reduced emission, real-time threat detection and avoidance, low probability of intercept (LPI) communication, and sensor management for data fusion.

(U) FY 1991 Accomplishments:
- (U) Improved survivability of aircraft through low probability of intercept communication and real-time threat avoidance.
- (U) Completed conceptual designs of an affordable Advanced Transport Aircraft avionics suite.

(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) FY 1993 Planned Program:
- (U) Demonstrate on laboratory simulator a concept for an improved aircraft data modem.
- (U) Demonstrate, in laboratory simulation, data fusion and sensor management techniques and algorithms to improve threat identification and location, on-board route replanning, and terrain-following to minimize exposure to threats during penetration missions.
- (U) Demonstrate, in-house, common module and reconfiguration strategies and concepts to create a robust, fault-tolerant avionic system capable of supporting various scenarios.

(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; and Lockheed, Ontario CA.

(U) Related Activities:
- (U) PE #0602204F, Aerospace Avionics.
- (U) PE #0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE #0603270F, Electronic Combat Technology.
- (U) PE #0603737D, Balanced Technology Initiative.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603260F
PE Title: Intelligence Advanced Development (IAD)
Budget Activity: #4 Tactical Programs

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3479 Advanced Sensor Exploitationtion | 634 | 973 | 1,600 | Cont | TBD |
| 3480 Automated Imagery Exploitation | 720 | 1,314 | 2,187 | Cont | TBD |
| 3481 Knowledge Based Technology for Intelligence | 2,059 | 2,194 | 2,232 | Cont | TBD |
| 3482 Scientific & Technical Intelligence Methodologies | 782 | 965 | 1.581 | Cont | TBD |
| Total | 4,195 | 5,446 | 7,600 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: Develops and demonstrates advanced technology toward specific intelligence systems capabilities and techniques to enhance theater commanders and National Command Authorities (NCA) capabilities for timely, all-source intelligence information. Primary 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 now and into the 21st century. 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 FY 1993:

1. (U) Project 3479, Advanced Sensor Exploitation (ASE): Develops near-real-time, all-source correlation/fusion capability by applying state-of-the-art processing techniques such as expert systems for receipt, correlation, templating and analysis of sensor data at the processing unit. Expert systems and Artificial Neural Systems techniques will assist the analyst by providing situation assessment and near-real-time display of events for the Commander. Capabilities include development of: operational intelligence data correlation algorithms and predictive intelligence algorithms as well as target analysis, target prioritization, air order of battle update, and C3CM tactical analysis techniques.

(U) FY 1991 Accomplishments:
- (U) Continued development of Rapid Application of Airpower (RAAP) baseline functional capability to provide an interactive prototype.
- (U) RAAP selected by HQ TAC as the targeting application for the Contingency TACS Automated Planning System (CTAPS). Recommended by TAC as the Tactical Air Forces (TAF) solution for targeting software.
- (U) Completed integration of hypothetical reasoning capability.
- (U) Completed analysis and demonstration of real-time battlefield simulation capability.

(U) FY 1992 Planned Program:
- (U) Continue RAAP functional development directed toward a full-scale prototype.

Program Element: #0603260F Budget Activity: #4 - Tactical Programs
PE Title: Intelligence Advanced Development (IAD)

- (U) Complete RAAP interfaces with Tactical Air Forces Linked Cps/Intel Centers (LOCE) Capability (TAFLC) and the Automated Planning System (APS) and integration into CTAPS.
- (U) Initiate Tactical Intel Fusion effort to expand the development of advanced correlation/fusion capabilites, incorporating components of ASE, RAAP, and other Rome Laboratory developments, that can be integrated into TAFLC Phase II and later fusion development efforts.

(U) FY 1993 Planned Program:
- (U) Continue Tactical Intel Fusion and development of advanced correlation/fusion capabilities, initiating efforts to incorporate advanced reasoning and neural network technologies into the correlation/fusion process.
- (U) Complete development of RAAP full scale prototype.
- (U) Initiate effort to provide operational fusion demonstration and evaluation environment that can be utilized to resolve system integration, operational and interoperability problems prior to fielding.

(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 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; BDM Corp., McClean, VA, and Harris Corporation, Melbourne, FL.

(U) Related Activities. IAD feeds the techniques, algorithms, software, and prototypes developed utilizing advanced technologies into various programs such as:
(U) Program Element #0604750F, Intelligence Equipment.
(U) Program Element #0602702F, Command, Control, & 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 Eiement #0603208F, Reconnaissance Sensor Development.
(U) Program Element #0603789F, Command, Control & Communications Advanced Development.
(U) Program Element #0603726F, C3I Subsystems 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.

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 I Interpretation, Target Graphics, Target Location, and Exploitation systems. Advances in the techniques of automated target detection,

Program Element: #0603260F Budget Activity: #4 - Tactical Programs
PE Title: Intelligence Advanced Development (IAD)

classification, identification, location, target graphics and reference scene generation for processing and interpretation will assist image interpreters and reconnaissance technicians by augmenting human intelligence in the manpower intensive task of imagery analysis.

(U) FY 1991 Accomplishments:
- (U) Completed the Semi-Automated Multi-Sensor, Multi-Spectral Exploitation (SAMME) to provide multi-sensor imagery, intel data, cartographic data and automated target detection on commercial softcopy work stations.
- (U) Completed development/integration of three dimensional advanced reference scene generation for long range conventional stand off weapons.
- (U) Continued negotiations with France for the Image Information Reformatter (I2R). MOU in staffing with DOD.
- (U) Initiated integration, in an open systems architecture, of existing image exploitation, cartographic, photogrammetric and intelligence data handling hardware & software into the Imagery Exploitation 2000 (IE-2000) testbed.
- (U) Developed a software program to perform automated point transfer to assist in target geopositioning.
- (U) Completed definition of the IE 2000 workstation.
- (U) Completed assessment of AF application for exploitation of multi-spectral imagery in the detection of target materials where the target area is less than one image pixel in size.

(U) FY 1992 Planned Program:
- (U) Complete evaluation of SAMME model.
- (U) Complete implementation of IE-2000 Testbed and initiate special applications programs.
- (U) Initiate US/France cooperative effort for I2R.
- (U) Initiate efforts to address problems of imagery storage and retrieval, imagery digitization and input/output (including video imagery), image registration and correlation.
- (U) Initiate P3I/Technology Transition program with the Joint Service Image Processing System (JSIPS).

(U) FY 1993 Planned Program:
- (U) Incorporate fully automated imagery exploitation technology into the IE2000 and conduct user evaluations in an operational environment.
- (U) Initiate application of Neural Network/computer vision technology into the IE 2000 image exploitation environment.
- (U) Initiate effort to develop a digital storage,simulataneous recieve/transmit capability for secondary imagery dissemination (SID) from multiple sources.
- (U) Implement development of a TAC INTNET compliant with open systems architecture to integrate imagery and intelligence data handling systems on the same network for force level intel production.

(U) Work Performed By: See Project 3479.

(U) Related Activities: See Project 3479.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Negotiations with France for the Imagery Information Reformatter (I2R) are continuing and

Program Element: #0603260F Budget Activity: #4 - Tactical Programs
PE Title: Intelligence Advanced Development (IAD)

the MOU is awaiting signature by France MOD.

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 1991 Accomplishments:
- (U) Initiated effort for seamless, multi-database access capability (Database Query Support Processor).
- (U) Developed and transitioned modifiable/maintainable Intelligence Timeline Analysis Expert System to surveillance, counter-narcotics, missile intelligence, and current Intel Centers in AFSPACOM, USSPACOM, and NORAD.
- (U) Delivered the Tactics Analysis Expert System to ESC.
- (U) Completed expert system for countering denial and deception techniques associated with mobile missiles.
- (U) Developed proof of concept testbed for machine-aided voice translation.
- (U) Initiated program to build generic message parsing system to automatically decompose fixed format messages for a multitude of intelligence users/applications.
- (U) Initiated work on Radar Warning Receiver (RWR) Expert Modeling System for AFEWC.

(U) FY 1992 Planned Program:
- (U) Conduct qualification test of Query Support Processor.
- (U) Continue to build generic message parsing system.
- (U) User evaluation of Intelligence Timeline Analysis Expert System in operational environment.
- (U) Continue transition of Timeline Analysis System.
- (U) Implement effort to build a machine-aided voice translation prototype based on earlier proof of concept.
- (U) Continue work on RWR Expert Modeling System.
- (U) Continue Generic Intel Processor effort.
- (U) Implement work on event categorization aid for the Tactic Analysis Expert System developed earlier.

(U) FY 1993 Planned Program:
- (U) Conduct benchmark test of Query Support Processor in context of operational environment.
- (U) Implement Generic Message Parsing Expert System for intelligence data processing.
- (U) Transition Intelligence Timeline Expert System to operational user.
- (U) Develop multi-domain/multi-command Intelligence Timeline Analysis Expert System.
- (U) Continue event categorization, install voice transition system at AFSAC and deliver RWR EW flagging model to AFEWC.
- (U) Conduct work on providing advanced analytical tools for current intelligence analyst at SPACECOM.
- (U) Initiate effort to develop electronic footlocker for the storage and retrieval of intelligence reference material not handled by current unit automated support systems

Program Element: #0603260F Budget Activity: #4 - Tactical Programs
PE Title: Intelligence Advanced Development (IAD)

for intelligence, i.e. regulations, publications, etc., to be utilized by tactical unit level intelligence.
- (U) Implement Narrow Band Space Object Identification Analysis. Answers CINCSPACE requirement to detect changes and anomilies to satellite status to support space I&W.

(U) Work Performed By: See Project 3479.

(U) Related Activities: See Project 3479.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 3482, Scientific and Technical Intelligence Methodologies: Conducts research on intelligence methodologies satisfy Air Force Foreign Technology Center (FTC) requirements. Technologies developed under this project enable FTC 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 1991 Accomplishments:
- (U) Developed expert system to assist the FTC intelligence analyst in extracting & collating data required for detailed analysis.
- (U) Continued the development of an expert system for analyzing Cobra series sensor data.

(U) FY 1992 Planned Program:
- (U) Complete development of system to analyze Cobra data.
- (U) Continue development of radar data base extraction tool.
- (U) Initiate development of Intelligence Analyst Associate.
- (U) Initiate development of an advanced intelligence information analysis tool.

(U) FY 1993 Planned Program:
- (U) Develop a set of automated tools to integrate and couple computer models between various branches at FTC.
- (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) Implement effort on Space Employment Simulation for FTC to support analysis of space systems employment through simulation.
- (U) Implement effort to develop a automated prototype document classifier with context vector/cluster tree technologies to permit automatic indexing of textual information.

(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 1993 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 | FY 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| ($000) | | | | |
| Propulsion | 56,316 | 76,600 | 90,000 | TBD |
| Airframe | 23,697 | 57,400 | 60,000 | TBD |
| Govt Work Pkgs & Matls | 65,387 | 30,000 | 4,516 | TBD |
| Applications | 2,600 | 650 | 650 | TBD |
| X-30 Aero-Spacecraft | 0 | 0 | 0 | TBD |
| Support Contract | 750 | 4,650 | 3,780 | TBD |
| In-House Support | 4,250 | 6,380 | 6,450 | TBD |
| GFE/Other | 8,520 | 24,353 | 10,053 | TBD |
| TOTAL[1] | 161,520 | 200,033 | 175,489 | TBD |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | (To Complete) |
| Program Milestones | Start Phase 2D-Oct | Continue Phase 2 | Continue Phase 2 | Complete Phase 3 |
| Engineering Milestones | Final Composite Config Def | Continue Design Config Def | Phase 3 Decision Activities | Design and Build X-30 |
| T&E Milestones | N/A | N/A | N/A | Flight Testing |
| Contract Milestones | National Team 2D | Continue Phase 2 | Continue Phase 2 | Complete Phase 3 |

[1] Detailed funding breakouts shown above the "TOTAL" line represent a pro-rata DoD share of joint DoD/NASA program. Total program for FY 1991 is $258M, FY 1992 is $205M, and FY 1993 is $255M.

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 (SSTO) 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 experimental airbreathing, hydrogen-fueled, SSTO 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 1991 Accomplishments:

- (U) Awarded letter contract to NASP National Contractor Team for 26 month effort to complete Phase 2 of NASP program.
- (U) Completed first airborne test of external burning concept.
- (U) Completed Multi Variable Trade Study which optimizes vehicle keel line.
- (U) Tested titanium matrix composite fuselage section with integrated carbon epoxy cryotank to 1300 degrees (F).
- (U) Tested titanium matrix composite panel/joint to 1300 degrees (F) through 150 cycles.
- (U) Completed testing of contractor unique wind tunnel models and construction of two team configuration models.
- (U) Fabricated and tested linear rocket platelet injectors.
- (U) Demonstrated end to end Low Speed Oxidizer System (LSOS) teamed configuration.
- (U) Tested 2 variations of the low speed component integration engine.
- (U) Tested subscale integrated engine (inlet combustor and nozzle).
- (U) Completed first and second design cycles of the National Contract Team's selected X-30 configuration.
- (U) Defined lines for airframe aerodynamic wind tunnel models based on selected X-30 configuration.
- (U) Demonstrated slush hydrogen fuel production, aging, storage, and transferring between tanks.

2. (U) FY 1992 Planned Program:

- (U) Design/initiate fabrication of airframe structural demonstration components based on selected X-30 configuration.
- (U) Complete testing on tank and fuselage structural articles.
- (U) Complete other small structural article tests.
- (U) Test module-to-module engine test rig.

Program Element: #0603269F
PE Title: National Aero-Space Plane (NASP) Technology Program
Project: #3384
Budget Activity: #2-Advanced Technology Development

- (U) Continue low speed engine performance tests.
- (U) Initiate design of concept demonstration engine.
- (U) Complete 3-D tests of external burning.
- (U) Complete Phase 3 cost estimate.
- (U) Conduct operability, supportability and utility studies to identify design drivers which enable low cost, on-demand access to space.
- (U) Complete 3rd design cycles of selected X-30 configuration.

3. (U) FY 1993 Planned Program:

- (U) Fabricate and initiate tests for concept demonstration engine.
- (U) Complete fabrication and test of large structural articles.
- (U) Complete 4th design cycle.
- (U) Complete Phase 2 engine and airframe testing and analyze final development data.
- (U) Phase 3 (build and flight test X-30) decision.
- (U) Initiate transition from Phase 2D to Phase 3.

4. (U) Program to Completion:

- (U) Conduct Systems Design Review of X-30.
- (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 conducted by contractors, universities, and DoD and NASA laboratories and centers. The national contractor team is managed by a National Program Office located at Palmdale, California. Contractors for engine development are: Pratt and Whitney, West Palm Beach, Florida; and Rocketdyne, Canoga Park, California. Airframe design and component development contractors are: General Dynamics, Fort Worth, Texas; McDonnell Douglas, Saint Louis, Missouri; and Rockwell, Downey, California. 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 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Schedule delay due to reduced funding in FY 1992 has caused a slip in the Phase 3 decision to Sep 93.
3. (U) COST CHANGES: Funding appropriations for FY 1992 were reduced from $231.8M to $200M causing a schedule delay.

Program Element: #0603269F
PE Title: National Aero-Space Plane (NASP) Technology Program
Project: #3384
Budget Activity: #2-Advanced Technology Development

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 Apr 86.
(U) DoD/NASA Memorandum of Understanding, 27 Sep 88.
(U) SAC/AFSPACECOM Memorandum of Agreement, 27 Nov 90.
(U) NASP Program Management Plan, 30 Jan 91.
(U) NASP Program Management Directive, 22 Mar 91.

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 86.
(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 88.
(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 3 funding (FY 94-97) established at $100M/yr as "placeholder" to be adjusted based on Phase 3 program cost estimates.
(U) This program has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

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 | 4Q/FY 1993 | Start of Phase 3 |
| X-30 First Atmospheric Flight | Currently under review | Start of flight research program to demonstrate NASP technologies |
| X-30 First Orbital Flight | Currently under review | Demonstration of first SSTO vehicle |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2222 Expendable/Off-board Countermeasures | 3,540 | 6,478 | 5,232 | Cont | TBD |
| 2432 Defensive System Fusion | 3,387 | 4,267 | 3,904 | Cont | TBD |
| 2754 Suppression of Enemy Defenses | 1,369 | 1,591 | 1,778 | Cont | TBD |
| 431G Threat Alert | 18,242 | 14,357 | 13,453 | Cont | TBD |
| 691X On-board Countermeasures | 7,110 | 5,952 | 8,414 | Cont | TBD |
| Total | 33,648 | 32,645 | 32,781 | 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 that have potential applications to satisfy tactical, strategic, special operations and airlift EW requirements and to reduce acquisition and life cycle costs of EW systems. The program develops and demonstrates 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. This program ensures a strong EW technology base is available to provide demonstrated counters to current and future threat capabilities.

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

1. (U) Project 2222, Expendable Countermeasures. This project develops and demonstrates systems and components for Infrared (IR), Electro-optic (EO), LASER, Radio Frequency (RF) and multi-spectral countermeasure technologies for application as expendable countermeasures. Improved antenna, transmitter, and multi-spectral and multi-technique off-board countermeasure technologies are developed and demonstrated.

(U) FY 1991 Accomplishments:
- (U) Designed and fabricated a brassboard decoy to counter millimeter wave seekers.
- (U) Demonstrated and tested an advanced [redacted] flare combining [redacted]

Program Element: #0603270F
PE Title: Electronic Combat Technology

Budget Activity: #2 Advanced Technology Development

- (U) Completed analysis and system requirements definition, and began development of dual Infrared/Radio Frequency (IR/RF) decoy.

(U) FY 1992 Planned Program:
- (U) Complete fabrication of brassboard millimeter wave decoy and begin laboratory demonstration.
- (U) Continue [ ] flare technology demonstration and test.
- (U) Design and develop illuminated chaff concept and plan for flight demonstration.
- (U) Complete design and begin development of dual IR/RF decoy concept.

(U) FY 1993 Planned Program:
- (U) Complete demonstration of millimeter wave decoy against projected advanced missile threat.
- (U) Complete development and begin testing of an illuminated chaff concept for countering radar tracking systems.
- (U) Conduct field test demonstration of a dual IR/RF decoy using aerodynamic flare and passive RF signature technology.

(U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB, OH manages this effort. Contractors include Lockheed-Sanders, Nashua, NH; Raytheon, Goleta, CA; and Tracor, Austin, TX.

(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. This project has been coordinated through the Project Reliance process to harmonize efforts and to eliminate duplication.
- (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) 2432 Defensive System Fusion: This project develops and demonstrates sensor and system fusion and integration, architecture, algorithm and assessment techniques and hardware technologies. These technologies will cope with the projected multi-spectral threat and countermeasure environments for strategic and tactical aircraft. This project develops advanced electronic combat advanced algorithm and artificial intelligence (AI) and expert software for applications on existing and future Electronic Combat systems. This project conducts real-time man in the loop and hardware in the loop integrated defensive avionics demonstrations.

(U) FY 1991 Accomplishments:
- (U) Demonstrate techniques to improve hostile radar identification through data fusion.
- (U) Demonstrate the Tactical Situation and Response Strategy (TSARS) to prove data fusion can improve response to the terminal threat.

(U) FY 1992 Planned Program:
- (U) Develop system design for Advanced Defensive Avionics Response Strategy (ADARS) system to fuse on-board, off-board and [ ] data.
- (U) Extend data fusion techniques for correlation of [ ] signals.
- (U) Complete demonstration of transportability and reusability of Ada coded EW functions and establish library Ada software modules.

Program Element: #0603270F
PE Title: Electronic Combat Technology

Budget Activity: #2 Advanced Technology Development

- (U) Demonstrate radar warning receiver hardware in the loop and mission simulation software integrated and processing threat environment simulators in real time.

(U) FY 1993 Planned Program:
- (U) Conduct initial ADARS demonstration and continue optimization of algorithms and software.
- (U) Conduct initial demonstration of sorting and identification hardware, algorithms and software modules.
- (U) Develop system requirements and conduct risk reduction for development of single sensor to fuse missile and laser warning functions.
- (U) Integrate real time mission simulation with [ ] to provide capability for defensive avionics fusion demonstration.

(U) Work Performed By: This project is managed by Wright Laboratory, Wright-Patterson AFB, OH. Contractors include: ITT, Nutley, NJ; Loral, Yonkers, NY; and Lockheed Sanders, Nashua, NH.

(U) Related Activities:
- (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 effort with the other services. This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (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 2754, Suppression of Enemy Defenses: This project develops and demonstrates C3CM, stand-off and support countermeasures technologies and techniques to deny, disrupt and suppress adversary air defense operations. This project provides advanced development of techniques and hardware for application to existing and new electronic warfare systems to counter threat systems (surface-to-air missile, antiaircraft artillery and air interceptors). The project includes the following areas: (1) supporting simulation efforts to guide investment through the evaluation of new concepts and techniques; (2) 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 to reduce on-board selfprotection countermeasure requirements.

(U) FY 1991 Accomplishments:
- (U) Conducted flight test demonstration of High Power Countermeasure (HPCM) risk reduction test bed against operational assets.
- (U) Developed system requirements and threat parameter evaluation for system to develop and test techniques against hostile [ ] signals.
- (U) Evaluate the [ ] technique at China Lake using the I-15 simulator and the Sabre Cross aircraft (modified 4950TW T-39).

(U) FY 1992 Planned Program:
- (U) Demonstrate low band advanced solid state transmitter.
- (U) Conduct analysis and evaluation of techniques to counter [ ] signals.

Program Element: #0603270F
PE Title: Electronic Combat Technology

Budget Activity: #2 Advanced Technology Development

- (U) Demonstrate a system to develop deceptive countermeasure techniques against hostile [ ] signals.
- (U) Begin system requirements and mission area analysis for HPCM host aircraft, receiver and analysis, and power requirements

(U) FY 1993 Planned Program:
- (U) Complete hardware and software demonstration and delivery of a workstation for in-house development of deceptive countermeasure techniques against hostile [ ] signals.
- (U) Develop system requirements for advanced development effort to demonstrate off-board wide area jamming system.
- (U) Conduct feasibility demonstration using laboratory demonstration model and begin design of advanced development models for brassboard hardware to counter [ ] signals.
- (U) Begin threat and receiver architecture evaluation to design and develop and flight test brassboard to jam navigation systems.

(U) Work Performed By: This project is managed by Wright Laboratory, Wright-Patterson AFB, OH. Contractors include: Raytheon, Goleta, CA; GTE, Mountain View, CA; and Calspan, Buffalo, NY.

(U) Related Activities:
(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 effort with the other services. This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
(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.

4. (U) 691X On-Board Countermeasures: This project develops, and demonstrates Infrared (IR), Electro-optic (EO), LASER and Radio Frequency (RF) countermeasure technologies. The technologies will be investigated for on-board application to strategic and tactical aircraft.

(U) FY 1991 Accomplishments:
- (U) Completed the design, and begin demonstration of critical system components for an EOCM application to [ ]
- (U) Completed analysis and design requirements for IR countermeasure field test.
- (U) Began requirements analysis for EO smart skin and developed design approach airborne application.
- (U) Completed flight test demonstration of [ ]
- (U) Completed fabrication and delivery of brassboard laser rangefinder countermeasure system and begin qualification testing.

Program Element: #0603270F
PE Title: Electronic Combat Technology

Budget Activity: #2 Advanced Technology Development

(U) FY 1992 Planned Program:
- (U) Demonstrate laser rangefinder countermeasures in cooperation with British government.
- (U) Conduct experiments to compare jamming techniques, including using [ ] to defeat IR missile.
- (U) Conduct critical design review of brassboard EO smart skin technology and begin fabrication.
- (U) Analyze and model turbulence interactions to predict propagation of laser beams through engine exhaust plume, and aircraft turbulent wake.
- (U) Coordinate with DARPA for design and development of a laser for a future Infrared Countermeasure (IRCM) system that will have wavelengths in the 2-3 micron, 3-5 micron and 8-12 micron wavelength regions. Emphasize packaging for airborne applications.
- (U) Perform live-fire testing against [ ] techniques.

(U) FY 1993 Planned Program:
- (U) Begin detailed design, fabrication and evaluation of a ground testable demonstration model for laser beamrider countermeasure techniques.
- (U) Design and conduct validation experiments for the Turbulence Interaction Model to produce laser transmission measurement database to support laser application for electro-optical countermeasures.
- (U) Complete CDR for experimental hardware to produce a wide range of turbulent conditions found behind aircraft.
- (U) Investigate and evaluate three monopulse ECM techniques that utilize a single shared aperture.
- (U) Begin design of countermeasure system, employing fiber optics, to counter laser trackers, designators and rangefinders.

(U) Work Performed By: The Wright Laboratory, Wright-Patterson AFB, OH, manages this project. Contractors include: Loral Defensive Systems, Akron, OH; Loral Nutronics, Newport Beach, CA; Raytheon, Goleta, CA; Hughes, Danburry, CT; SAIC, Dayton, OH; Lockheed Sanders, Nashua, NH.

(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. This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
(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: [ ]

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603270F
PE Title: Electronic Combat Technology

Project Number: 431G
Budget Activity: #2 Advanced Technology Development

A. (U) RESOURCES ($ In Thousands)

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 431G Threat Alert | 18,242 | 14,357 | 13,453 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project develops and demonstrates advanced technologies for threat warning to enhance aircraft survivability and provide aircrew situation awareness. Missile/aircraft warning, LASER warning and RF receiver technologies developed and demonstrated under this project. Advanced electronic combat preprocessor technologies, advanced sorting and preprocessing algorithms and expert software for applications on existing and future Electronic Combat systems are also developed and demonstrated. These technology components are demonstrated as flyable brassboards against validated threat simulators to the maximum extent practical.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Demonstrated Random Agile Deinterleaver (RAD) algorithm in ALR-69 to improve signal processing and resolution time.
   - (U) Began application/insertion of the RAD algorithm to other systems such as ALR-56M.
   - (U) Completed development and bench testing of scanning focal plane array sensor technology and began flight test qualification to establish range performance and false alarm characteristics..
   - (U) Completed fabrication and bench test of single aperture antenna to detect all polarizations of RF signals.
   - (U) Developed and coded algorithm for simulation testing versus validated threat signals to demonstrate advanced pulse preprocessing technique.

2. (U) FY 1992 Planned Program:
   - (U) Design, develop and demonstrate hardware, algorithms (including RAD insertion) and software modules for product improvement for radio frequency receiver sorting and identification.
   - (U) Complete design and begin development of hardware and algorithms to provide covert missile time to intercept for warning receivers.
   - (U) Complete anechoic chamber testing of all-polarization brassboard antenna.
   - (U) Develop requirements and system design for advanced high accuracy angle of arrival threat warning antenna.
   - (U) Demonstrate advanced intrapulse preprocessor applications to RF receiver functions.
   - (U) Conduct a flight test in conjunction with Canada of a miniaturized laser warning sensor(MINLAWS).
   - (U) Conduct live fire flight test demonstration of scanning focal plane array sensor technology.

3. (U) FY 1993 Planned Program:
   - (U) Complete design and begin fabrication of high sensitivity sensor to detect and warn of laser beam rider missiles.
   - (U) Conduct flight tests to measure the IR signature of various missiles.
   - (U) Begin analysis of missile IR signature flight test data and correlation with model predictions.
   - (U) Begin fabrication of high accuracy, single aperture antenna, to detect and measure angle of arrival of

Program Element: #0603270F
PE Title: Electronic Combat Technology

Project Number: 431G
Budget Activity: #2 Advanced Technology Development

radar emitters.

- (U) Complete bench testing and integrated test bed (ITB) demonstration of advanced preprocessing prototype hardware and algorithms (including RAD insertion).
- (U) Complete laboratory testing and begin field testing of hardware and algorithms to provide covert missile time to intercept for warning receivers.
- (U) Fabricate, deliver and begin ground testing of prototype single aperture interferometer laser warning detector.

4. (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: AVW Electronics, Los Angeles, CA; Loral, Yonkers, NY; Hughes, Danburry, CT; Motorola, Phoenix, AZ; GE, Utica, NY; Texas Instrument, Dallas TX; Loral, Lexington, MA; Cincinnati Electronics, Cincinnati, OH; MERCER, Robins, GA; and Lockheed Sanders, Nashua, NH.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Project's technical change reflects restructure within the program element due to program priorities and execution.
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): 304-80, Tactical Self Protection Electronic Warfare System, 15 Jan 81 (S/NF).
  304-84, EF-111A Tactical Jamming System, 1 Mar 87 (S/NF).
  316-88, Tactical Aircraft Missile Warning System, 6 Sep 89 (S/NF).
  341-88, Radio Frequency Countermeasures, 30 Oct 89 (S/NF)
  321-88, Laser Warning Receiver, 13 Sep 89 (S/NF).
  323-88, Advanced Infrared Countermeasures, 6 Sep 89 (S/NF).

- (U) SAC SON(s): 12-86, Enhanced Monopulse Countermeasures, 5 Feb 87.(S)
  02-86, Improved Interceptor and Missile Warning for Strategic Attack Aircraft, 18 Feb 86 (S).
  20-86, Physical Damage Countermeasure for Bomber Defense against Airborne Interceptors, 1 Nov 86 (S)
  06-81, Monopulse Countermeasure, 14 Aug 81 (S).

- (U) MAC SON(s): 07-81, Defensive Systems for Airlift Aircraft, 8 Sep 81.(S)
  08-81, Defensive Systems for Combat Rescue Helicopters, 8 Sep 81.(S)
  09-81, Defensive Systems for Combat Rescue HC-130 Aircraft, 8 Sep 81 (S/NF).
  04-91, Advanced Infrared Countermeasures, Draft, (S/NF).

- (U) AFSPACECOM SON: 07-84, Satellite On-Board Attack Reporting System, 3 Jun 85 (S).

Program Element: #0603270F
PE Title: Electronic Combat Technology

Project Number: 431G
Budget Activity: #2 Advanced Technology Development

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. This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (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: Laser warning is coordinated with Canada through efforts of Subgroup Q under The Technical Coordination Program.

J. (U) MILESTONE SCHEDULE:

| | Dates |
|---|---|
| 1. (U) RAD Insertion Critical Design Review | 3Q FY 92 |
| 2. (U) Complete RAD insertion ITB Demo | 4Q FY 93 |
| 3. (U) Complete Preprocessing Hardware/Software ITB Demo | 4Q FY 93 |
| 4. (U) Complete Field Test Demo of Two Sensor Integration Covert TTI for Missile Warning | 2Q FY 94 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603302F
PE Title: Space and Missile Rocket Propulsion
Budget Activity: #2 - Advanced Technology Development

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 6339 Air-Launched Missile Propulsion Technology | 800 | 0 | 0 | Cont | TBD |
| 6340 Space Systems Propulsion Technology | 8,322 | 11,566 | 12,000 | Cont | TBD |
| 6341 Ballistic Missile Propulsion Technology | 2,100 | 1,925 | 3,516 | Cont | TBD |
| Total | 11,222 | 13,491 | 15,516 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology (S&T) program demonstrates advanced rocket propulsion technology options for space and ballistic missile systems. This critical technology enables new warfighting capabilities, enhances system survivability and operational flexibility, and ensures the reliability and affordability of space and ballistic 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. In addition, this program will, in conjunction with Advanced Spacecraft Technology (PE 0603401F), integrate and demonstrate the capabilities of electric propulsion, advanced solar arrays, and autonomous guidance, navigation, and control technologies for orbit transfer missions. The Electric Insertion Transfer Experiment (ELITE) is being conducted under a cooperative research and development agreement between the Phillips Laboratory and industry. This program complements technology development conducted by the other Services and NASA.

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

1. (U) Project 6339, Air-Launched Missile Propulsion Technology: This project demonstrates rocket propulsion technology options for air-to-air and air-to-surface missiles. This project demonstrated an advanced energy management concept with low signature propellant and thrust vector control technology in FY 1991. The high performance, low observable (HPLO) motor technology can increase tactical missile maneuverability by 200 percent and reduce infrared detection range by 60 percent.

(U) FY 1991 Accomplishments:
- (U) Successfully fired a series of heavyweight motors on ground test stands to demonstrate pulsed motor capabilities.
- (U) Transitioned 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) None.

(U) FY 1993 Planned Program:
- (U) None.

(U) Work Performed By: Project is managed by the Phillips Laboratory, Propulsion Directorate, Edwards AFB, CA. The HPLO motor contractor was Hercules/ABL, Rocket Center, WV.

(U) Related Activities:
(U) Program Element #0602302F, Rocket Propulsion and Astronautics Technology.
(U) Program Element #0603601F, Conventional Weapons.
(U) Program Element #0603792N, Multi-Mission Propulsion Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 6341, Ballistic Missile Propulsion Technology: This project, in conjunction with Ballistic Missile Technology (PE 0603311F), will demonstrate rocket propulsion technology options for intercontinental ballistic missile (ICBM) systems. The first task will demonstrate advanced integrated stage technology in FY 1992. This simplified booster configuration can increase missile range by 20 percent and reduce booster fabrication costs by 30 percent. This project will start a second task in FY 1992 to demonstrate advanced ICBM booster technologies. This task will focus on a two-stage booster configuration, integrating a conical-shaped composite case, environmentally-safe propellants, and advanced integrated stage technologies. The booster technologies can enhance system survivability and increase the cost effectiveness of ICBMs in a post-START (Strategic Arms Reduction Talks) environment.

(U) FY 1991 Planned Program:
- (U) Updated integrated stage design based on results of bench-scale component evaluation tests.
- (U) Successfully ground-tested heavyweight motor with advanced integrated stage and boron-based propellant technology.
- (U) Fabricated intermediate-size test motors for final ground test firings in FY 1992 to verify integrated stage performance.

(U) FY 1992 Planned Program:
- (U) Perform ground test firings under simulated altitude conditions to demonstrate capability of integrated stage technology.

Program Element: #0603302F Budget Activity: #2 - Advanced Technology Development
PE Title: Space and Missile Rocket Propulsion

- (U) Evaluate advanced propellants for ICBM motors.
- (U) Complete preliminary design and analysis of advanced ICBM booster technologies such as materials and processing and advanced composite cases.

(U) FY 1993 Planned Program:
- (U) Fabricate advanced ICBM booster nozzle components for bench-scale testing to evaluate designs.
- (U) Evaluate design integrity of booster components, including conical composite case, in a series of bench-scale tests.
- (U) Update advanced ICBM booster design using component tests.
- (U) Develop preliminary design of advanced ICBM booster demonstration motor.

(U) Work Performed By: Project is managed by the Phillips Laboratory, Propulsion Directorate, Edwards AFB, CA. The only contractor is GenCorp/Aerojet Propulsion, Sacramento, CA.

(U) Related Activities:
(U) Program Element #0602302F, Rocket Propulsion and Astronautics Technology.
(U) Program Element #0603311F, Ballistic Missile Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603302F
PE Title: Space and Missile Rocket Propulsion
Project Number: 6240
Budget Activity: #2 - Advanced Technology Development

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

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Space Systems Propulsion Technology | 8,322 | 11,566 | 12,000 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides rocket propulsion technology options for satellites and orbit transfer vehicles. The first task will demonstrate storable liquid engine technology in FY 1992. This experimental liquid engine, designated the XLR-132, can increase satellite maneuverability by 40 percent. The second task will flight-qualify 30-kWe arcjet (electric) propulsion technology on the ground in FY 1993. The flight-qualified arcjet technology will be used in two follow-on space experiments--the Electric Propulsion Space Experiment (ESEX) and the Electric Insertion Transfer Experiment (ELITE). ESEX will verify the performance of the 30-kWe arcjet propulsion subsystem in space. Starting in FY 1992, this project will jointly develop ELITE with PE 0603401F. The ELITE task will demonstrate the mission capabilities of integrated electric orbit transfer vehicle (EOTV) technologies, including arcjet propulsion, advanced solar arrays, and autonomous guidance, navigation, and control (GN&C). These technologies can significantly reduce space launch costs and increase operational flexibility. For example, 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 fourth task in FY 1993 to demonstrate advanced cryogenic engine (ACE) technology. This modular engine technology will enable more reliable upper stages to deliver large payloads to orbit at a lower cost than current systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Successfully completed ground test firings of XLR-132 engine under sea level conditions at contractor facilities.
   - (U) Fabricated arcjet propulsion system components, including thruster and power conditioning unit, for bench-scale tests.
   - (U) Evaluated design of arcjet propulsion system components in a series of bench-scale tests and update component designs.
   - (U) Conduct preliminary design review of full-scale arcjet propulsion system.

2. (U) FY 1992 Planned Program:
   - (U) Demonstrate XLR-132 engine under conditions which simulate orbit transfer mission from low earth to high earth orbit.

Program Element: #0603302F
PE Title: Space and Missile Rocket Propulsion
Project Number: 6240
Budget Activity: #2 - Advanced Technology Development

- (U) Transition XLR-132 engine to Space Systems Division program offices as outlined in signed technology transition plan.
- (U) Fabricate and ground-test arcjet propulsion system to verify performance and reliability of components.
- (U) Conduct critical design review of arcjet propulsion system.
- (U) Complete preliminary design and analysis of ELITE subsystems.

3. (U) FY 1993 Planned Program:
   - (U) Perform final series of ground tests in vacuum chamber to flight-qualify arcjet propulsion system for ESEX experiment.
   - (U) Evaluate design of ELITE subsystem components through series of bench-scale tests.
   - (U) Conduct critical design review of ELITE subsystems.
   - (U) Fabricate electric propulsion subsystem and instrumentation package.
   - (U) Complete design and analysis of advanced cryogenic engine technologies, including turbomachinery and thrust chamber.

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

D. (U) WORK PERFORMED BY: Project is managed by the Phillips Laboratory, Propulsion Directorate, Edwards AFB, CA. Three contractors are: Aerojet Propulsion, Sacramento, CA (XLR-132 Engine); Rockwell/Rocketdyne, Canoga Park, CA (XLR-132 Engine); and TRW, Redondo Beach, CA (30-kWe Arcjet). The ELITE joint venture is managed by the Phillips Laboratory, Space Experiments Directorate, Kirtland AFB, NM, and TRW, Redondo Beach, CA, using a cooperative research and development agreement (CRDA).

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Starting in FY 1992, this project will jointly execute ELITE with PE 0603401F. Under the provisions of the CRDA, the Phillips Laboratory is responsible for developing the electric propulsion, advanced solar array, and instrumentation subsystems and delivering flight hardware to TRW for integration into the experimental spacecraft.
2. (U) SCHEDULE CHANGES: The Advanced Cryogenic Engine Technology task was slipped to FY 1993 to provide FY 1992 funding for ELITE.
3. (U) COST CHANGES: Starting in FY 1992, this project will jointly fund the ELITE task with PE 0603401F.

F. (U) PROGRAM DOCUMENTATION:
- (U) None.

Program Element: #0603302F
PE Title: Space and Missile Rocket Propulsion
Project Number: 6240
Budget Activity: #2 - Advanced Technology Development

G. (U) RELATED ACTIVITIES:
(U) Program Element #0602302F, Rocket Propulsion and Astronautics Technology.
(U) Program Element #0603401F, Advanced Spacecraft Technology.
(U) Program Element #0603402F, Space Test Program (STP).
(U) Program Element #0305171F, Space Shuttle Operations (Upper Stages).
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

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

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

J. (U) MILESTONE SCHEDULE:

| | |
|---|---|
| 1. (U) Flightweight XLR-132 Storable Engine | |
| Flightweight Engine Demonstration | 1st Quarter, FY 1992 |
| Technology Transition | 2nd Quarter, FY 1992 |
| 2. (U) 30-kWe Arcjet | |
| Arcjet Flight-Qualification | 4th Quarter, FY 1993 |
| ESEX Delivery to STP | 4th Quarter, FY 1994 |
| STP Mission P91-1 Launch | 4th Quarter, FY 1995 |
| 3. (U) ELITE | |
| Design Review | 2th Quarter, FY 1993 |
| Spacecraft Integration & Test | 2th Quarter, FY 1995 |
| STP Launch | 3th Quarter, FY 1996 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603307F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability Advanced Development

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3018 Air Base Operability | 3,369 | 3,343 | 3,700 | Cont | TBD |
| Total | 3,369 | 3,343 | 3,700 | 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 PROJECT LESS THAN $10.0 MILLION IN 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 1991 Accomplishments:

- (U) Aircraft Shelter Upgrade/Retrofit Program: Continued analysis to produce specifications and design drawings.
- (U) Mobile Explosive Ordnance Disposal Laser Tool: Continued mobile system development to include actual laser tests on munitions.
- (U) Vertical Chaff: Completed test analysis and published final report.
- (U) Explosive Hazard Reduction: Initiated phase I to develop a design for 40mm (M933) grenade container.
- (U) Camouflage Radar Experiment (CAMREX): Provided nets to cover doors of U.S. aircraft shelters at Glize Rijan AB NL in support of CAMREX.
- (U) Camouflage, Concealment, and Deception manual: Provided support for annual update.
- (U) Dispersed Integrated Security System: Developed an integrated network design of shelf sensors and computers for demonstration and validation (Security Police detection information).
- (U) Survivability of Structures: Continued analysis and testing on survivability of structures on piles in saturated soils.
- (U) Camouflage, Concealment, and Deception (CCD) Equipment Demo: Characterized Microturbo smoke cloud, demonstrated infrared nets, and designed and fabricated F-15 decoy.
- (U) Smoke Methodology Handbook: Initiated development of a smoke employment methodology handbook.

Program Element: #0603307F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability Advanced Development

- (U) Combat Base Assessment Model (CBAM): Completed upgrades to simulation of air base ground defenses and point air defenses. Began distribution to users.
- (U) Prepared and published worldwide ABO threat compendium. Provided detailed intelligence studies for selected threats.

(U) FY 1992 Planned Program:

- (U) Aircraft Shelter Upgrade/Retrofit Program: Conduct shelter upgrade validation test of hardening and the effect on sortie generation.
- (U) Mobile Ordnance Disrupter System: Design subsystems.
- (U) Survivability of Structures on Piles: Conduct lab and field tests for further design analysis. Conduct validation testing.
- (U) Camouflage, Concealment, and Deception Equipment Demo: Demonstrate advanced Infra-Red nets, smokes, and applique camouflage.
- (U) Smoke Methodology Handbook: Complete and publish smoke/obscurants employment manual.
- (U) ABO Threat Document (Foreign Technology Division): Update world-wide ABO threat compendium to include revised threats.
- (U) Multi-spectral Aircraft Decoys: Develop multi-spectral decoy and associated equipment test and evaluation plan for F-15 and F-16.

(U) FY 1993 Planned Program:

- (U) Aircraft Shelter Upgrade/Retrofit Program: Coninue shelter validation testing
- (U) Mobile Ordnance Disrupter System: Design and integrate subsystems and conduct System Design Review.
- (U) Camouflage, Concealment and Deception: Laser detector and smoke launcher, decoy aircraft shelter, deceptive paints and stains, update Smoke Handbook, smoke against precision guided munitions, F-16 multi-spectral aircraft decoy, and runway signature disguise.
- (U) Survivability of Structures on Piles: Continue lab and field testing for survivability of structures in saturated soils.
- (U) Damage Assessment: Begin demonstration and validation of promising technologies identified during the FY 91 Damage Assessment Technology Study.
- (U) Minefield Clearance: Award contract for demonstration and validation.
- (U) ABO Threat Document (Foreign Technology Division): Update world-wide ABO threat compendium to include revised threats.
- (U) Explosive Hazard Reduction: Develop munition storage plans and provide on-site storage siting training.

(U) Work Performed By: Sparta Inc., Huntsville AL; Diversified Engineering Inc., Richmond VA; and Sverdrup Technology, Eglin AFB FL. In-house development by Aeronautical Systems Division and Armstrong Laboratory, Wright-Patterson AFB OH; Air Force Civil

Program Element: #0603307F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability Advanced Development

Engineering Services Agency, Tyndall AFB FL; Electronic Systems Division, Hanscom AFB MA; Air Force Weapons Laboratory and Phillips Laboratory, Kirtland AFB NM; and Aeronautical Systems Division, 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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603311F
PE Title: Ballistic Missile Technology
Budget Activity: #2 - Advanced Technology Development

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 4091 Missile Electronics | 44,004 | 48,143 | 57,762 | Cont | TBD |
| 4092 Reentry Vehicle Penetration Technology | 10,200 | 5,416 | 6,421 | Cont | TBD |
| 4093 Propulsion and Booster Technology | 545 | 1,838 | 1,830 | Cont | TBD |
| 4094 Survivability/Endurability Technology | 0 | 296 | 595 | Cont | TBD |
| 4095 Technology Integration and Demonstration* | 9,765 | 7,352 | 0 | 0 | 22,117 |
| Total | 64,514 | 63,045 | 66,608 | Cont | TBD |

* Project content consolidated into Project 4091 and 4092 in FY 1993.

B. (U) BRIEF DESCRIPTION OF ELEMENT: Through FY 1991, Intercontinental Ballistic Missile (ICBM) technology development work was performed in the Advanced Strategic Missile Systems (ASMS) 6.3B program element. Beginning in FY 1992, the former ASMS 6.3B advanced development program element 63311F was redirected into a 6.3A advanced technology development program. Ballistic Missile Technology (BMT) is an Air Force Science and Technology program providing technology for existing and future ICBM systems and subsystems. BMT develops and demonstrates fully integrated, synergistic technologies under realistic operational conditions. Near-term emphasis is on technologies which provide low-cost, low-maintenance, increased reliability, and increased performance and survivability. 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 in various laboratories, performs technology tradeoffs, develops new hardware, and conducts ground and flight testing (Advanced Technology Transition Demonstration (ATTD)). A vigorous BMT program maintains technological superiority, thereby maintaining U.S. "R&D Deterrent" and a flexible ICBM force for different U.S. security options within a changing global environment.

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

1. (U) Project 4092, Reentry Vehicle Penetration Technology (RVPT): This project develops reentry phenomenology technology and technologies required for weapons delivery and penetration of a RV through enemy defenses. Reentry phenomenology technology addresses new reentry vehicle materials, aerodynamics characterization, and integration for reentry vehicles and decoys. Weapons delivery technology will address development of technologies to increase the probability of kill of ICBMs against their targets. Defense penetration technology provides penetration aid options for defeating current

radar and projected optical antiballistic missile threats. RVPT technology supports the draft SAC Mission Needs Statement (MNS) 01-90, Prompt Strategic Strike Capability (PSSC) for 2010.

(U) FY 1991 Accomplishments:
- (U) High Performance Maneuvering RV (HP-MaRV) ground tests were conducted on a series of subscale models and test samples at the Arnold Engineering Development Center in support of Computational Fluid Dynamics code validation.
- (U) Continued upgrade of computational codes to support HP-MaRV development.
- (U) Completed fabrication and flight qualification of Pyrotechnic optical penetration aid carrier vehicle (decoy sized).

(U) FY 1992 Planned Program:
- (U) Complete the HP-MaRV Phase 1 program initiated in FY 1991 to define technology options for test vehicle configurations and an Advanced Technology Transition Demonstration plan.
- (U) Initiate HP-MaRV flight test vehicle design and fabrication (Advanced Vehicle Experiment (AVEX)).

(U) FY 1993 Planned Program:
- (U) Continue flight test vehicle design and fabrication for the AVEX program.
- (U) Initiate design for modification of an existing reentry vehicle for tests of materials in reentry environments.
- (U) Continue Pyrotechnic flight test analysis and design of flight test payloads and vehicles started under Project 4095.

(U) Work Performed By: Phillips Laboratory, Kirtland AFB NM, is the responsible technical activity. Major contractors include: Aerotherm Corp, Mountain View CA; Sparta, 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).

(U) Related Activities:
- (U) Program Element #0602102F, Materials.
- (U) Program Element #0602204F, Aerospace Avionics.
- (U) Coordinated DARPA activity to evaluate emerging miniature guidance systems development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 4093, Propulsion & Booster Technology: This project integrates missile and propulsion technologies for existing and future ICBMs to optimize systems 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: (a) support the high priority Minuteman life extension; and (b) demonstrate rocket propulsion technologies to extend performance, enhance producibility, increase reliability, and lower life cycle costs of ICBMs. Exploratory development and advanced development of rocket propulsion technologies done under PEs 0602302F and 0603302F will feed into

the BMT 6.3A projects. In this project, rocket propulsion will be integrated with other missile technologies.

(U) FY 1991 Accomplishments:
- (U) Assessed feasibility of using low-cost composite fabrication techniques for one piece molding of advanced motor cases.
- (U) Began validation testing of the manufacturing process for Novoltex exit cones.

(U) FY 1992 Planned Program:
- (U) Demonstrate environmentally safe propellants with suitable mechanical and ballistic properties in large scale mixes for use in the remanufacture of Minuteman stages 2 and 3.

(U) FY 1993 Planned Program:
- (U) Initiate an ATTD program to demonstrate emerging technologies using innovative methods and advanced component technologies to reduce ICBM life cycle costs.

(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 Systems Division, San Jose CA; Atlantic Research Corporation, Gainesville VA; and Rockwell/Rocketdyne Division, Canoga Park CA.

(U) Related Activities
(U) Program Element #0603302F, Space & Missile Rocket Propulsion.
(U) Program Element #0602302F, Rocket Propulsion & Astronautics Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 4094, Survivability/Endurability (S/E) Technology: This technology improves the survivability, reliability, endurability, and maintainability of existing and future ICBM systems/subsystems. This project includes basing technology to increase hardness and enhance endurance. This project will address survivable communications needs and supporting technologies for both future fixed and mobile based ICBMs. S/E technology is used to support risk reduction technology development in response to draft SAC Mission Needs Statement (MNS) 01-90, Prompt Strategic Strike Capability (PSSC) for 2010 .

(U) FY 1991 Accomplishments:
- (U) None.

(U) FY 1992 Planned Program:
- (U) Analyze ICBM communications requirements and threats.
- (U) Initiate technology application study for improved launch support equipment to complement advances in guidance and propulsion.

(U) FY 1993 Planned Program:
- (U) Explore survivable antenna technologies for Launch Control Facilities.
- (U) Complete technology application study for improved launch support equipment.

(U) Work Performed By: The responsible agency is the Phillips Laboratory, Kirtland AFB NM. Basing contractors include: SAIC, LaJolla CA; and Boeing, Redmond WA. C3 contractors include: GTE, Westboro MA and Loral, Philadelphia PA.

(U) Related Activities:
(U) Program Element #0602702F, Command Control and Communications.
(U) Program Element #0602203F, Aerospace Propulsion.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 4095: Technology Integration and Demonstration This project integrates and flight validates technologies developed in the BMT program and will provide demonstrated technology options for existing and future ICBM systems.

(U) FY 1991 Accomplishments:
- (U) Reduced Maneuvering Systems Technology (MaST) flight test plasma data.
- (U) Planned flight test to gather high altitude density data and test motor for Pyrotechnic program optical masker.
- (U) Completed development/testing of small payload ejector assembly for the decoy sized Pyrotechnic carrier vehicle.

(U) FY 1992 Planned Program:
- (U) Fly full-scale (modified Mk 12) and decoy-sized pyrotechnic carrier vehicles in a combined missile flight.
(U) Begin analysis of Pyrotechnic flight test results.
- (U) Initiate design of BMT flight test payloads and vehicle.
- (U) Initiate test and evaluation of maneuvering vehicle test bed for testing of Global Positioning System aided guidance.

(U) FY 1993 Planned Program:
- (U) Project terminated.
- (U) Pyrotechnic flight test analysis transferred to Project 4092.
- (U) Design of BMT flight test payloads and vehicles transferred to Project 4092.
- (U) Test and evaluation of maneuvering vehicle test bed for GPS transferred to Project 4091.

(U) Work Performed By: The responsible agency is the Phillips Laboratory, Kirtland AFB NM. Major ICBM systems contractors include: McDonnell Douglas SSC, Huntington Beach CA, Rockwell Intl/Autonetics SSD, Anaheim CA; and Boeing, Redmond, WA.

(U) Related Activities:
(U) Program Element #0602204F, Avionics.
(U) Program Element #0602302F, Rocket Propulsion.
(U) Program Element #0602102F, Materials.
(U) Program Element #0601102F, Defense Research Sciences.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603[illegible]F
PE Title: Ballistic M[illegible]sile Technology
Project Number: 4091
Budget Activity: #2 - Advanced Technology Development

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

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Missile Electronics | 44,004 | 48,143 | 57,762 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The current goal of the Missile Electronics project is to develop and demonstrate technologies to support advanced guidance that maintains present day accuracies while dramatically reducing acquisition and support costs for existing and future intercontinental ballistic missiles (ICBMs). The Ballistic Missile Technology (BMT) guidance technology projects focus on two efforts. The Advanced Inertial Measurement System (AIMS) is an advanced technology transition demonstration (ATTD) program resulting from technology studies completing in early FY 1991. The AIMS technology development will provide and demonstrate low-cost guidance components based on new generation 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 1991 Accomplishments:
   - (U) Completed AIMU Flight Qualification Test, delivered four Flight Test Units, and continued ground test program.
   - (U) Awarded contracts initiating the AIMS advanced technology transition demonstration to design, fabricate, integrate, and ground test technology for low-cost guidance with solid state instruments.
   - (U) Evaluated integrated guidance options.
   - (U) Assessed capability of Global Positioning System (GPS) aided guidance for ICBM applications.
   - (U) Performed radiation testing of AIMU Ring Laser Gyros.
   - (U) Conducted evaluation of four candidate guidance architectures.

2. (U) FY 1992 Planned Program:
   - (U) Complete ground and dormancy testing of AIMU.
   - (U) Continue the AIMS program to design, fabricate, integrate, and ground test technology for low-cost guidance with solid state instruments.
   - (U) Complete Integrated Guidance Study.
   - (U) Initiate program to fabricate, integrate, and test a reentry vehicle for flight testing of a small, light weight, low-cost guidance unit featuring a GPS update being developed by DARPA.

3. (U) FY 1993 Planned Program:
   - (U) Complete fabrication and performance testing of AIMS engineering test units and begin fabrication of flight quality prototype units for FY 1994 delivery and test.
   - (U) Continue fabrication, integration, and test planning of the DARPA GPS guidance unit test vehicle.

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

D. (U) WORK PERFORMED BY: The responsible agency is the Phillips Laboratory, Kirtland AFB 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). Clearwater FL; Northrop, Hawthorne CA; and Litton Industries, Woodland Hills CA. Technical execution of the AIMS program will reside at the Ballistic Missile Organization, Norton AFB CA.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Integration and flight validation of the DARPA GPS guidance unit were transferred to this project from Project 4095.
2. (U) SCHEDULE CHANGES: Not Applicable.
3. (U) COST CHANGES: Funding for integration and flight validation of the DARPA GPS guidance unit was transferred to this project from Project 4095.

F. (U) PROGRAM DOCUMENTATION:
- (U) AFLC SON 001-90, Improved Reliability/Maintainability Advanced Guidance Systems for ICBMs, dated 23 Feb 90.
- (U) Draft SAC Mission Needs Statement (MNS) 01-90, Prompt Strategic Strike Capability for 2010.

G. (U) RELATED ACTIVITIES:
(U) Program Element #0602204F, Avionics.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

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

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

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. (U) | Complete AIMU Dormancy Test | 3rd Quarter, FY 1992 |
| 2. (U) | Complete AIMS Engineering Test Unit Test | 2nd Quarter, FY 1993 |
| 3. (U) | Complete AIMS interim design review | 1st Quarter, FY 1994 |
| 4. (U) | GPS Inertial Measurement Unit flight test | 4th Quarter, FY 1994 |
| 5. (U) | Complete AIMS hardware delivery | 1st Quarter, FY 1995 |
| 6. (U) | Complete AIMS ATTD | 3rd Quarter, FY 1995 |
| 7. (U) | Complete AIMS final design review | 3rd Quarter, FY 1995 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603363F Budget Activity: #2 - Advanced Technology Development
PE Title: Armament Technology Integration

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2718 Air-to-Surface Armament Technology Integration | 563 | 250 | 0 | 0 | 37,694 |
| 3254 Advanced Air-to-Air Missile Technology Integration | 403 | 1,881 | 0 | 0 | 2,362 |
| Total | 966 | 2,131 | 0 | 0 | 40,056 |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This advanced development program integrates selected air-to-surface and air-to-air conventional weapons technologies. This program element terminates in FY 1993.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 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 1991 Accomplishments:
- (U) Designed and began fabrication of an all-composite missile strongback for advanced flight test vehicles compatible with the F-16 aircraft.

(U) FY 1992 Planned Program:
- (U) Conduct synthesis studies of selected air-to-surface weapon subsystems.
- (U) Complete fabrication, integration, and structural test of advanced test vehicle composite strongback.
- (U) Perform windtunnel test required to obtain flight clearances for launching advanced missile airframe from F-16.

(U) FY 1993 Planned Program:
- (U) None.

(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 0603601F, Conventional Weapons Technology.
(U) PE 0602602F, Conventional Munitions.
(U) PE 0603313A, Missile/Rocket Components.
(U) PE 0603792N, Advanced Technology Demonstrations.
(U) PE 0603611M, Mobile Protected Gun System.

Program Element: #0603363F Budget Activity: #2 - Advanced Technology Development
PE Title: Armament Technology Integration

(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 investigates 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 1991 Accomplishments:
- (U) Conducted planning for future integration/demonstration program and coordinated with Advanced Medium Range Air-to-Air Missile Program Office and Joint Service AIM-9X Program Office.

(U) FY 1992 Planned Program:
- (U) Complete selection of air-to-air subsystem technologies based upon simulation trade studies and tri-Service coordination for integration demonstration.

(U) FY 1993 Planned Program:
- (U) None.

(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, and at 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603401F Budget Activity: #2 - Advanced Technology Development
PE Title: Advanced Spacecraft Technology

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2181 Advanced Space Electronics Technology | 8,705 | 11,900 | 13,100 | Cont | TBD |
| 2198 Advanced Space Technology Assessments | 200 | 0 | 0 | 0 | 2,465 |
| 3784 Advanced Space Communications Technology | 1,201 | 1,864 | 2,700 | Cont | TBD |
| 3834 Advanced Spacecraft Technology Integration | 1,400 | 1,400 | 8,000 | Cont | TBD |
| 3977 Thermionic Space Power | 719 | 10,200* | 6,000 | Cont | TBD |
| 4183 Space Communications Subsystems Integration | 0 | 0 | 3,000 | Cont | TBD |
| 682J Advanced Space Power Technology | 1,900 | 2,550 | 3,405 | Cont | TBD |
| Total | 14,125 | 27,914 | 36,205 | Cont | TBD |

* An additional $10 million was appropriated by Congress for this project.

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 subsystem technology. Efforts are focused on three high-leverage areas: advanced space qualifiable microelectronics; assured, secure space communications; and compact, survivable space power generation and storage. The space electronics technology project will supply the baseline computer systems technology for future satellite programs. Based on the DoD Software Master Plan, this program is also developing space unique software technology to accelerate and reduce the cost of spacecraft software development/ validation and to increase the use of artificial intelligence (AI) to reduce the dependence on ground station contacts for routine satellite management. The program will also integrate advanced spacecraft technologies into space flight demonstrations to decrease the time required to transition innovative spacecraft technologies and to reduce the development risk and cost required to incorporate this technology.

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

1. (U) Project 2198, Advanced Space Technology Assessments: This project documented capability needs for current and future space systems, related them to technology development programs, and assessed the abilities of the programs to meet system requirements. This analysis focused the advanced spacecraft technology investment.

(U) FY 1991 Accomplishments:
- (U) Completed satellite autonomy and space environment assessments.

Program Element: #0603401F Budget Activity: #2 - Advanced Technology Development
PE Title: Advanced Spacecraft Technology

(U) FY 1992 Planned Program:
- (U) Project terminated.

(U) FY 1993 Planned Program:
- (U) Project terminated.

(U) Work Performed By: Project terminated.

(U) Related Activities: Project terminated.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3784, Advanced Space Communications Technology: This project develops extremely high frequency (EHF) and other advanced space communications technologies. Efforts support the Integrated Satellite Control System and Military Satellite Communication System architecture(s). The thrust of the program is improved affordability, reliability, and performance as well as a threefold reduction in communications payload size, weight, and power requirements. High dynamic range uplink, downlink, and crosslink payloads will be developed to transmit/receive information at low, medium, and high data rates in the presence of interference.

(U) FY 1991 Accomplishments:
- (U) Fabricated and tested a 44 gigahertz (GHz) frequency receiver designed for interference mitigation.
- (U) Fabricated and tested a 60 GHz low noise amplifier.
- (U) Completed 60 GHz transmission diode reliability and radiation hardening tests.

(U) FY 1992 Planned Program:
- (U) Start development of optically implemented EHF frequency hopping synthesizer.
- (U) Start development of a high dynamic range mixer and a crosslink antenna for a 60 GHz communications system.
- (U) Complete 44 GHz receiver development.

(U) FY 1993 Planned Program:
- (U) Complete 60 GHz low noise amplifier development.
- (U) Start development of a 60 GHz diplexer.
- (U) Continue development of 60 GHz crosslink antenna and mixer.

(U) Work Performed By: Managed by the Directorate of Space and Missiles Technology, Phillips Lab, Kirtland AFB, NM. Contractors are: General Electric, Valley Forge, PA and Syracuse, NY; Chang Industries, LaVerne, CA; RDL, Culver City, CA; MPB Technologies, Pointe Claire, Quebec, Canada; and MIT-Lincoln Laboratories, Boston, MA.

Program Element: #0603401F Budget Activity: #2 - Advanced Technology Development
PE Title: Advanced Spacecraft Technology

(U) Related Activities:
- (U) PE 0602702F, Command/Control/Communications.
- (U) PE 0603250F, Lincoln Laboratory.
- (U) PE 0603789F, Tactical C3 Advanced Development.
- (U) PE 0603226E, Experimental Evaluation of Major Innovative Technologies.
- (U) PE 0604711F, EHF Satellite Communications R&D.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3834, Advanced Spacecraft Technology Integration: This project integrates maturing technologies into space flights to demonstrate their practicality in an operational environment. There are currently two integration demonstrations; the Technology for Autonomous Operational Survivability (TAOS) experiment and the Electric Insertion Transfer Experiment (ELITE). The TAOS program is a survivability demonstration for space computers and other state-of-the-art survivability and autonomy technologies. TAOS hardware will be integrated into a small spacecraft placed into a low earth orbit for 12 months. TAOS will demonstrate and validate advanced spaceborne computers, autonomous navigation, laser sensors, radar sensors, advanced data buses, and various spacecraft operational concepts. The Phillips Laboratory and TRW, through a CRDA (Cooperative Research and Development Agreement), are developing ELITE, a precursor to an electric orbit transfer vehicle (EOTV). An EOTV enables more payload mass, launching heavy payloads from medium lift launch vehicles, and new on-orbit capabilities such as increased repositioning of space assets. The objective of the ELITE program is to design, build, and demonstrate an EOTV in a representative mission scenario. The vehicle will integrate a state-of-the-art arcjet propulsion subsystem; a high-power solar power subsystem; and an autonomous guidance, navigation, and control package. Essential mission demonstrations include altitude and inclinatrion changes, and operation in the Van Allen radiation belts. Under the CRDA the Air Force provides the major subsystems and their diagnostics, the launch vehicle, launch site, and on-orbit operations.

(U) FY 1991 Accomplishments:
- (U) Developed Mission Requirements Document (MRD) to detail ELITE program missions and test objectives.
- (U) Performed extensive EOTV mission analysis to maintain traceability of ELITE designs to operational systems.
- (U) Completed test of a 10 kilowatt (kW) arcjet to demonstrate 50% more hours of operation than required for the ELITE mission
- (U) Signed the CRDA between the Phillips Laboratory and TRW.

Program Element: #0603401F Budget Activity: #2 - Advanced Technology Development
PE Title: Advanced Spacecraft Technology

(U) FY 1992 Planned Program:
- (U) Complete TAOS payload integration and launch mission.
- (U) Initiate on-orbit mission analysis of TAOS payload performance.
- (U) Initiate development of major Air Force ELITE subsystems; including the solar array, arcjet, and the diagnostic systems for eventual integration into the space flight demonstration.
- (U) Conduct a design review for the integration of the major subsystems with the TRW spacecraft.
- (U) Select the launch vehicle and establish the interface between the booster and the ELITE demonstration.
- (U) Establish the interface control documents between the spacecraft and the major subsystems.

(U) FY 1993 Planned Program:
- (U) Complete TAOS post mission data analysis.
- (U) Conduct ELITE program preliminary design review (PDR).
- (U) Begin detailed designs of all ELITE system components.
- (U) Initiate development of long lead subsystems based on PDR.
- (U) Begin development/acquisition of spealized diagnostic systems.
- (U) Perform solar array and arcjet breadboard hardware tests.
- (U) Perform comprehensive integrated power processing unit (PPU)/arcjet cycled endurance test in a flight configuration.
- (U) Begin development of ELITE software including command and control, verification of orbital parameters, and verification of spacecraft health and status.

(U) Work Performed By: Managed by Phillips Laboratory/Space Experiments Directorate, Kirtland AFB, NM and TRW Military Space Systems Division, Redondo Beach, CA. Contractors include: TRW, Redondo Beach, CA; Microcosm, Torrance, CA; Rockwell, Anaheim, CA; Honeywell, Phoenix, AZ; GTE, Sunnyvale, CA; and Sandia National Laboratory, Albuquerque, NM.

(U) Related Activities:
(U) PE 0603302F, Space and Missile Rocket Propulsion.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 4183, Space Communications Subsystems Integration: This project develops and fabricates advanced spacecraft subsystems and provides payload/launch support for a multi-mission Advanced Standard Satellite Bus (ASSB) and the associated small upper stage. The ASSB will incorporate standard technologies to reduce satellite weight and cost, while achieving high payload mass fraction. The ASSB will feature a standard, "bolt-on" payload interface to enable rapid integration of advanced technology payloads, including extremely high frequency (EHF) payloads, and operations in a wide

range of orbits. Increased performance, affordability, and interoperability will be given highest priority. This effort is part of the DARPA-led, joint-Service Advanced Satellites Technologies and EHF Communications (ASTEC) demonstration. The demonstration goals are to develop technologies to enable a new very high data rate EHF capability required for surveillance and command and control connectivity; develop space-qualified advanced EHF and satellite subsystem technologies to support Military Satellite Communication System (MILSATCOM) modernization; assess the utility of small satellites to rapidly and affordably augment MILSATCOM architecture; and to significantly reduce acquisition "time-to-market" for new satellite systems. This effort also contributes to the joint DoD Advanced Technology Demonstration for Global Surveilance and Communications Integrated Demonstration.

(U) FY 1991 Accomplishments:
- (U) None, this is a new project.

(U) FY 1992 Planned Program:
- (U) None, this is a new project.

(U) FY 1993 Planned Program:
- (U) Initiate design of reliable, high efficiency, lightweight EHF components, high-speed signal processors, and high power frequency hopping synthesizers.
- (U) Initiate planning for the EHF Communications Advanced Technology Demonstration.

(U) Work Performed By: Managed by Space Experiments Directorate of Phillips Laboratory, Kirtland AFB, NM. No contracts have been awarded.

(U) Related Activities:
(U) PE 0603226E, Experimental Evaluation of Major Innovative Technologies.
(U) PE 0603006A, C3.
(U) PE 0603726F, C3I Subsystems Technology.
(U) PE 0602702F, C3.
(U) PE 0602203F, Aerospace Propulsion.
(U) PE 0602782A, C3 Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 682J, Advanced Space Power Technology: This project demonstrates compact, survivable, non-nuclear satellite power generation, storage, and processing systems. Power generation work is focused on lightweight, low-cost, and moderately survivable

Program Element: #0603401F Budget Activity: #2 - Advanced Technology Development
PE Title: Advanced Spacecraft Technology

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. Power processing efforts focus on producing lightweight, high efficiency, standardized subsystem designs for use on future high power, more survivable Air Force satellites.

(U) FY 1991 Accomplishments:
- (U) Completed preliminary design for the NaS flight experiment.
- (U) Completed initial assessment of thin film solar cell technology readiness.
- (U) Continued transition of gallium-arsenide solar cells to Defense Meteorological Satellite System (DMSS) and Global Positioning System (GPS) satellites.
- (U) Completed the Power Systems Analyzer Code to enable modeling of advanced spacecraft power systems on common personal computers.

(U) FY 1992 Planned Program::
- (U) Obtain the first NiH2 low earth orbit 5 year life test data.
- (U) Continue tests to validate advanced battery model.
- (U) Initiate the advanced solar array project to meet mid-1990's satellite power requirements at half current costs.
- (U) Determine feasibility of standard modular designs for lightweight, efficient power processing equipment.

(U) FY 1993 Planned Program:
- (U) Construct and flight qualify the NaS flight experiment.
- (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) Place additional NiH2 cells on low earth orbit test.
- (U) Obtain 3 year life test data on NiH2 battery.

(U) Work Performed By: Managed by the Phillips Lab, Kirtland AFB, NM. Work performed by: NASA's Jet Propulsion Laboratory, Pasadena, CA; the Naval Weapons Support Center, Crane, IN; the Aerospace Corp, El Segundo, CA; and the Phillips Laboratory, Kirtland AFB, NM.

(U) Related Activities:
- (U) PE 0602302F, Rocket Propulsion.
- (U) PE 0603226E, Experimental Evaluation of Major Innovative Technologies.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603401F
PE Title: Advanced Spacecraft Technology
Project Number: 2181
Budget Activity: #2 - Advanced Technology Development

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

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Advanced Space Electronics Technology | 8,705 | 11,900 | 13,100 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This advanced technology development project will demonstrate the capability to manufacture and ensure producibility of radiation hardened very high speed integrated circuits (VHSIC) based components, wafer-scale packages, and subsystems. This program will enable interchangeable, interoperable, and standardized data and signal processing systems for most Air Force space applications. The Advanced Spaceborne Computer Module (ASCM) program integrates several joint Air Force/Strategic Defense Initiative 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 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. Current satellite programs do not have standardized software and each developer must design, debug, and validate operating software for each new major upgrade in satellite on-board processing. This project will develop and verify reusable software with standard interfaces for spacecraft developers to use.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Integrated main memories, input/output devices, and power converters into 16 bit ASCM Central Processor Module (CPM) forming single functional unit to manage satellite sensor and communications data.
   - (U) Delivered 256K Static Random Access Memory (SRAM) engineering units to space system users.
   - (U) Completed preliminary validation of the qualified manufacturer's list (QML) approach to space qualifying radiation-hardened VHSIC devices which has significantly reduced their cost.
   - (U) Deliverd three advanced flight computers to payload integration.

2. (U) FY 1992 Planned Program:
   - (U) Assemble, test, and space qualify first CPMs and deliver to satellite users.

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PE Title: Advanced Spacecraft Technology
Project Number: 2181
Budget Activity: #2 - Advanced Technology Development

- (U) Begin design on the 32-bit Advanced Technology Insertion Module (ATIM).
- (U) Develop non-volatile memories for insertion into ATIM.
- (U) Develop high speed advanced integrated circuit packaging.

3. (U) FY 1993 Planned Program:
   - (U) Integrate non-volatile memory technologies in ATIM demonstrations.
   - (U) Begin manufacturing process for the sub-micron technology ATIM.
   - (U) Begin on-array processor study to determine user speed and processing requirements.
   - (U) Begin development of advanced high speed 1 megabit SRAM.
   - (U) Complete development of requirements for a spacecraft operating system.
   - (U) Incorporate advanced artificial intelligence (AI) technology in an in-house design and simulation center (DSC) to address spacecraft developer and controller requirements

4. (U) Program to Completion:
   - (U) Assemble, test, and space-qualify 32-bit ATIMs and sub-micron chipset.
   - (U) Develop on-array processor technology for high throughput satellites.
   - (U) Incorporate processor with sensor array to provide true on-array processing.
   - (U) Develop radiation hardening technology improvements to linear circuit devices.
   - (U) Continue development of standard operating system and incorporate advanced fault tolerance techniques for satellites.
   - (U) Continue to develop and transfer state-of-the-art AI techniques to space systems and ground control, including range asset management.

D. (U) WORK PERFORMED BY: Project is managed by the Phillips Laboratory, Space and Missiles Directorate, Kirtland AFB NM. Two contractors performing the ASCM effort are: Honeywell, Clearwater, FL; and IBM, Manassas, VA.

E. (U) COMPARISON WITH FY 1992 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) USSPACECOM MROC 04-88, Integrated Satellite Control System, Jan 88.
   - (U) AFSPACECOM SON 006-89 (Draft) Space Support, Interoperability and Readiness.

Program Element: #0603401F
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G. (U) RELATED ACTIVITIES:
(U) PE 0102431F, Advanced Warning System (AWS).
(U) PE 0303603F, MILSTAR Satellite Communication System.
(U) PE 0305160F, Defense Meteorological Satellite System.
(U) PE 0305165F, NAVSTAR Global Positioning System.
(U) PE 0603226E, Experimental Evaluation of Major Innovative Technologies.
(U) PE 0604609F, R&M for Technical Insertion Program.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

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

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

J. (U) MILESTONE SCHEDULE:

1. (U) ASCM

| | |
|---|---|
| CPM Qual/Delivery | 1Q FY 1992 |
| ATIM CDR | 4Q FY 1993 |
| ATIM Qual/Delivery | 4Q FY 1994 |

2. (U) SPACE SOFTWARE

| | |
|---|---|
| Expert shell for 1750A | 1Q FY 1993 |
| DSC Initial Capability | 4Q FY 1993 |
| Basic Autonomy Demo | 3Q FY 1996 |
| AI based Console | 4Q FY 1996 |
| Adv Autonomy Demo | 3Q FY 1999 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603401F
PE Title: Advanced Spacecraft Technology
Project Number: 3977
Budget Activity: #2 - Advanced Technology Development

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

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Thermionic Space Power | 719 | 10,200 | 6,000 | Cont | TBD |

(U) B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
Thermionic reactors directly convert thermal energy to electrical energy. This project will develop and demonstrate the technologies which are required in addition to the nuclear reactor that are associated with thermionic space nuclear power systems for military missions. It will assess the practicability of such advanced space nuclear power systems. It will investigate space nuclear power alternatives to increase power subsystem performance, lifetime, survivability, and safety while reducing costs. It will help to define technology and reactor objectives to guide Department of Energy (DoE) space nuclear power programs in support of DoD needs. The objective is to develop the technologies which support a 5-40 kW reactor for a potential flight demonstration decision in FY 1994/1995. Power requirements in this range have been identified as enabling technologies for space-based surveillance satellites, electric orbit transfer capability, advanced meteorological satellites, and future early warning system missions.

C. (U) PROGRAM ACCOMPLISHMENT AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Implemented post-irradiation examination of emitter and insulator samples, heat pipe testing, and space nuclear power utility studies.
   - (U) Assessed five system designs and their technology status.
   - (U) Defined Air Force mission needs for space nuclear power.
   - (U) Performed in-house experiments and analyses of thermionic designs.

2. (U) FY 1992 Planned Programs:
   - (U) Build and test a thermionic heat pipe module.
   - (U) Conduct converter evaluation of new thermionic element emitter materials.
   - (U) Begin developing and testing materials for the thermionic element emitter and collector, electrical insulators, fuel containment, and connectors.
   - (U) Plan a flight experiment for the liquid metal heat pipe.
   - (U) Identify issues and payoffs for integrating thermionic space nuclear power into DoD satellites.
   - (U) Perform fuel test for the Star-C space nuclear reactor design.

Program Element: #0603401F
PE Title: Advanced Spacecraft Technology
Project Number: 3977
Budget Activity: #2 - Advanced Technology Development

3. (U) FY 1993 Planned Programs:
   - (U) Define flight experiment integration and testing requirements.
   - (U) Perform ground testing on the liquid metal heat pipe.
   - (U) Begin life testing on the thermionic heat pipe module.
   - (U) Initiate program to produce single crystal emitters.
   - (U) Begin design development of a hybrid thermionic space nuclear power and propulsion concept.

4. (U) Program to Completion:
   - (U) Develop and integrate the non-nuclear technologies which support the nuclear reactor.
   - (U) Continue to develop advanced technologies for spaceborne nuclear power systems.

D. (U) WORK PERFORMED BY: Project is managed by Phillips Laboratory, Space and Missiles Directorate, Kirtland AFB, NM. Government organizations include: Los Alamos National Lab, Los Alamos, NM; Sandia National Lab, Albuquerque, NM; and 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.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGE: Not Applicable.
2. (U) SCHEDULE CHANGE: Not Applicable.
3. (U) COST CHANGE: Additional $10M added by Congress in FY 1992 for thermionics.

F. (U) PROGRAM DOCUMENTATION:
   - (U) AFSPACECOM SON 85-1 Compact Space Power, approved 1989.

G. (U) RELATED ACTIVITIES:
   (U) PE 0602203F, Aerospace Propulsion.
   (U) PE 0603217C, Follow-On Systems.
   (U) SP-100 Space Nuclear Power project by DOE, NASA, and SDIO.
   (U) Thermionic Fuel Element Verification by DOE and SDIO.
   (U) Memorandum of Understanding among DOE, SDIO, and USAF Concerning Thermionic Space Nuclear Power Systems.
   (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

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

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

Program Element: #0603401F
PE Title: Advanced Spacecraft Technology

Project Number: 3977
Budget Activity: #2 - Advanced Technology Development

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. (U) | Concept Downselect | FY 1994 |
| 2. (U) | Preliminary Design Review | FY 1994 |
| 3. (U) | Flight Demonstration Go/No Go | FY 1995 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #06034[illegible]F
PE Title: Space Test Program (STP)

Budget Activity: #6 Defense Wide Mission Support

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2617 Free-Flyer Spacecraft Missions | 41,505 * | 44,676* | 54,400 | Cont | TBD |
| 2618 Quick Response Shuttle Missions | 0 | 0 | 500 | Cont | TBD |
| 2620 Shuttle Sortie Missions | 9,540 | 0 | 0 | 0 | N/A |
| TOTAL | 51,045* | 44,676* | 53,700 | Cont | TBD |

* Includes $9M in FY91 and $5M in FY92 for AF Geophysics Laboratory High Frequency Active Auroral Research Program (HAARP) which is unrelated to STP.

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Space Test Program (STP) advances DOD technology by providing spaceflight 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. 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 expedite the infusion of new technology into space systems through the use of simpler incrementally designed, man-aided experiments. Experience gained from this approach is key in fully defining military man's role in space.

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

1. (U) Project 2618, Quick Response Shuttle Missions: This STP project supports the flight of Quick Response Shuttle Payloads (QRSPs) experiments. 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. 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 1993, this project funds payments to NASA for Shuttle flight charges which directly support QRSP projects. Prior to this time, NASA provided this support to DOD at no cost in exchange for services of comparable value under a Memorandum of Agreement.

(U) FY 1991 Accomplishments:
- (U) Eighteen STP experiments flown on seven Shuttle missions.
- (U) Supported one MMIS experiment on one Shuttle flight.

(U) FY 1992 Planned Program:
- (U) Integrate and fly 24 Middeck experiments on eight flights.

Program Element: #0603402F
PE Title: Space Test Program (STP)
Budget Activity: #6 Defense Wide Mission Support

- (U) Integrate and fly two MMIS experiments on one Shuttle flight including Army TERRA SCOUT which used dedicated DOD payload specialist.
- (U) Integrate eighteen STP experiments for two FY 93 Shuttle flights.

(U) FY 1993 Planned Program:
- (U) Integrate and fly sixteen STP experiments on two Shuttle flights.
- (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 Launch Support)
(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 2620, Shuttle Sortie Missions: This STP project supported approximately .16% of the Tri-Service primary experiment spaceflight requirements and approximately 3% of the secondary experiment spaceflight requirements. This STP project advanced DOD space technology by flying experiments on Shuttle sortie missions (payloads/experiments which are returned) which demonstrated 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 accomplished its pathfinder role of using the Shuttle as a manned DOD space laboratory. The project developed 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 provided 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.

(U) FY 1991 Accomplishments:
- (U) Launched AFP-675 and STP-1 on Shuttle flight STS-39; accomplished associated mission operations, post-flight recovery and data distribution. The AFP-675 mission included the following experiments: Phillips Laboratory's (PL) Cryogenic Infrared Radiance Instrument for Shuttle (CIRRIS)-1A, Naval Research Laboratory's (NRL) Far Ultraviolet Camera (FAR UV) and PL's Horizon Ultraviolet Photometer (HUP) and Quadropole Ion Neutral Mass Spectrometer experiments. STP-1 consisted of PL's Spacecraft Kenetic Infrared Test (SKIRT), NRL's Ultraviolet Limb Imaging Experiment (UVLIE) and SSD's Advanced Liquid Feed Experiment.

Program Element: #0603402F
PE Title: Space Test Program (STP)

Budget Activity: #6 Defense Wide Mission Support

(U) FY 1992 Planned Program:
- (U) This project ends in FY 1991 with the completion of AFP-675. All primary experiments, including Shuttle Get-Away-Special (GAS) canisters and hitchhiker mounting systems, 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 Launch Support) 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: Not Applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

FY 1993 BIENNIAL RDT&E DESCRIPTIVE 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Free-Flyer Spacecraft Missions | 41,505* | 44,676* | 53,700 | Cont | TBD |

* Includes $9M in FY 91 and $5M in FY 92 for AF Geophysics Laboratory High Frequency Active Auroral Research Program (HAARP) which is unrelated to STP.

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 "Free-Flyer/Shuttle Bay" 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 six 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 all free flyer experiments, including Shuttle Get-Away-Special (GAS) canisters and hitchhiker mounting systems, previously funded under Project 2620. In addition, technical support and program office support (civilian pay, travel, supplies) funds are included in this project. The FY 93 funding increase supports continued development of Space Test Experiment Platform (STEP) missions two and three along with the initiation of missions four and five.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Discontinued on-orbit support for P87-2 Space Charging at High Altitude (SCATHA) satellite after 12 year mission.
   - (U) Continued on-orbit support for P87-1 Polar Bear, P87-2 STACKSAT and P86-1 Combined Release and Radiation Effects Satellite (CRRES).
   - (U) Launched P89-1A Independent Space Experiment System (ISES) mission consisting of Radiation Experiment (REX) satellite.
   - (U) Continued P89-1B ISES mission integration of Los Alamos National Laboratory's Array of Low Energy X-Ray Imaging Sensors (ALEXIS) experiment.
   - (U) Cancelled Scout launch of NRL's withdrawn Passive Radio Frequency Interference Location Experiment (PROFILE) P90-2.
   - (U) Awarded contract for P90-6 Advanced Photovoltaic and Electronics Experiments (APEX) mission to be launched on Pegasus.
   - (U) Completed initial design phase for the STEP mission 1 (P90-1) and began hardware fabrication and development testing.
   - (U) Exercised contract option, completed initial design phase and began hardware fabrication/development testing for STEP mission C (P90-5). Supports Phillips Laboratory's Technology for Autonomous Operational Survivability (TAOS) experiment.
   - (U) Completed P91-2 STEP mission 2 feasibility study in support of Signal Identification Experiment (SIDEX).

Program Element: #0603402F
PE Title: Space Test Program (STP)
Project Number: 2617
Budget Activity: #6 Defense Wide Mission Support

- (U) Awarded contract for P91-1 (formerly P91-B) mission to be launched on a medium launch vehicle.
- (U) Began integration of Phillips Laboratory's Automated Charge Control at geosynchronous altitude (CHARGECON-GEO) experiment on the DSCS III.
- (U) Completed feasibility study for NRL's Precise Range and Range Rate experiment (PRARE) on Global Positioning System.
- (U) Continued integration of Navy Magnetospheric Atmospheric X-ray. Imaging Experiment (MAXIE) and Energetic Heavy Ion Composition (EHIC) for launch on the Thermal Infrared Observation Satellite (TIROS)-I mission.
- (U) Continued integration of Remote Atmospheric & Ionospheric Detection System (RAIDS) on TIROS-J.
- (U) Continued integration of Middle Atmoshphere High Resolution Spectrograph (MAHRS) on CRISTA-SPAS satellite.
- (U) Began integration of Solar Wind Imaging Experiment (SWIM) on NASA WIND satellite.
- (U) Initiated piggyback mission study of Navy Polar Orbiting Geomagnetic Survey (POGS)-II on Defense Meteorlogical Satellite Program.
- (U) Continued integration of Shuttle Potential and Return Electron Experiment (SPREE) on the joint NASA/Italian Tethered Spacecraft mission aboard the Shuttle.

2. (U) FY 1992 Planned Program:
   - (U) Complete on-orbit mission of P86-1 CRRES.
   - (U) Continue on-orbit support for P87-1 Polar Bear, P87-2 STACKSAT and P89-1A REX.
   - (U) Launch P89-1B ALEXIS experiment and start on-orbit support.
   - (U) Initiate, integrate and launch Radar Calibration (RADCAL) experiment.
   - (U) Continue Pegasus/APEX mission integration.
   - (U) Continue integration/test for STEP missions one and zero.
   - (U) Complete initial design phase for STEP mission two P91-2 SIDEX.
   - (U) Initiate STEP mission three.
   - (U) Complete System Design Review for P91-1.
   - (U) Launch EHIC/MAXIE and SPREE experiments.
   - (U) Continue integration of TIROS I&T, Charge Con, SWIM, CRISTA SPAS, POGS II.

3. (U) FY 1993 Planned Program:
   - (U) Support STACKSAT, P89-1A/B and Polar Bear flight operations and science data collection.
   - (U) Launch Pegasus/P90-6 APEX and conduct on-orbit support.
   - (U) Launch and conduct on-orbit support for STEP missions one and zero.
   - (U) Continue design and development of STEP missions two and three.
   - (U) Initiate STEP missions four and five.
   - (U) Continue P91-1 development with Preliminary & Critical Design Reviews.
   - (U) Launch MAXIE/EHIC on TIROS/Atlas E.
   - (U) Continue integration of SWIM, Charge-Con, CRISTA SPAs & RAIDS.
   - (U) Launch SPREE on STS-46.

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

D. (U) WORK PERFORMED BY: Air Force Systems Command, Space Systems Division, Los Angeles AFB, CA, The Aerospace Corporation, El Segundo, CA. Office

Program Element: #0603402F
PE Title: Space Test Program (STP)

Project Number: 2617
Budget Activity: #6 Defense Wide Mission Support

of 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; Rockwell International, Seal Beach CA.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: PROFILE launch was cancelled subsequent to Navy withdrawal of the experiment due to cost growth/schedule delays with their satellite contractor.

2. (U) SCHEDULE CHANGES: P89-1A REX launch accelerated from Sep 91 to Jul 91 to meet user need. Launch slip for STEP mission one is due to AF Small Launch Vehicle contract award delay and technical changes.

3. (U) COST CHANGES: FY 92 Congressional reduction and $5 million reallocation to HAARP eliminates integration of LAGEOS and PRARE experiments.

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 Launch Support) 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) Launch P89-1B ALEXIS on Pegasus | 2Q FY 1992 |
| (U) Shuttle launch of Tethered Sat System/SPREE | 4Q FY 1992 |
| (U) P91-1 Preliminary Design Review | 1Q FY 1993 |
| (U) TIROS launch of EHIC and MAXIE | 1Q FY 1993 |
| (U) TIROS launch of RAIDS | 2Q FY 1993 |
| (U) Launch P90-6 APEX on Pegasus | 2Q FY 1993 |
| (U) Launch STEP Mission Zero (P90-5 TAOS) on DARPA Taurus | 2Q FY 1993 |
| (U) Launch P91-4 SWIM on NASA WIND satellite | 3Q FY 1993 |
| (U) P91-1 Critical Design Review | 3Q FY 1993 |
| (U) Launch STEP Mission One (P90-1) on AFSLV/Pegasus | 4Q FY 1993 |
| (U) Ariane launch of POAM-II on SPOT satellite | 1Q FY 1994 |
| (U) Launch of STEP Mission 2 P91-2 SIDEX on Pegasus | 1Q FY 1994 |
| (U) Launch MAHRS on CRISTA-SPAS | 3Q FY 1994 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603410F Budget Activity: #2 - Advanced Technology
PE Title: Space Systems Environmental Interactions Technology Development

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2821 Space Systems Design and Test Standards | 700 | 723 | 467 | Cont | TBD |
| 2822 Interactions Measurement Payloads | 3,897 | 3,514 | 3,000 | Cont | TBD |
| 2823 Charge Monitoring and Control Systems | 685 | 634 | 715 | Cont | TBD |
| Total | 5,282 | 4,871 | 4,182 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program develops for space flight, advanced technology investigations that provide demonstrated, cost-effective solutions to mitigate hazardous space environmental interactions that degrade spacecraft operations. The information gained through these programs is directly transferred to operational users in the form of new and revised military standards, handbooks, and computer-aided engineering (CAE) and assessment (CAA) tools. Advanced technology products include: (1) an autonomous active charge control system (CCS) to prevent charge buildup on high-altitude spacecraft; (2) a compact environmental anomaly sensor (CEASE) to provide warning to satellites of space-environmental conditions likely to cause anomalous operations; (3) new CAA tools for foreign spacecraft mission assessment based on optical measurements of effluent and other environmental interactions; and (4) improved specifications for advanced solar array technologies. The program's objective is to improve Air Force space system survivability and reliability and expedite the transfer of new technology into planned military capabilities.

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

1. (U) Project 2821, Space Systems Design and Test Standards: This project integrates the results of experiments conducted under Project 2822, Interaction Measurement Payloads, into useful analysis tools for Air Force space system operators and designers. Results are used to improve engineering design guidelines and test standards, develop improve radiation models and new microelectronic test standards, and to enhance computer codes/models to aid in the analysis of environment-induced effects on spacecraft systems. Results are used by Space Systems Division Product Divisions.

(U) FY 1991 Accomplishments:
- (U) Delivered new Space Environment Military Standard (MIL-Std) to Space Division.
- (U) MIL-Std 1809 installed on NASA's Environet network.

Program Element: #0603410F Budget Activity: #2 - Advanced Technology Development
PE Title: Space Systems Environmental Interactions Technology

(U) FY 1992 Planned Program:
- (U) Complete new Surface Charging Standard and Guidelines draft.
- (U) Deliver Space Environmental Handbook to Space Division.
- (U) Continue Combined Release/Radiation Experiment Satellite (CRRES) data assessment for revised radiation models.

(U) FY 1993 Planned Program:
- (U) Deliver Surface Charging Standard and Guidelines to Space Systems Division.
- (U) Complete revised microelectronics total-dose test standard.

(U) Work Performed By: This project is managed by AFSC's Phillips Laboratory, Geophysics Directorate, Hanscom AFB, MA. The main contractors performing the work are: S-Cubed, Inc., La Jolla, CA; Spectral Sciences, Inc., Burlington, MA; University of Chicago, Chicago, IL.; Louisiana State University, LA; and Lockheed Palo Alto Research Laboratory, Palo Alto, CA.

(U) Related Activities:
(U) NASA/USAF Space Technology Interdependency Group coordinates efforts and reviews programs annually.
(U) PE 0602101F, Geophysics.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 in order to understand how new materials and technologies are affected by space. Unfortunately, much still remains unknown on the exact interaction mechanisms that cause degradation in thermal insulators, optical sensor deterioration, and deep-dielectric arcing that can cause overheating, spurious detector signals, and upsets in microelectronics. The project's technical goals are: (1) to improve the S&T base by developing space instrumentation that will measure the hazards posed by the natural environment; (2) to develop systems to mitigate or eliminate identified hazards; (3) where mitigation is not possible, to provide specifications on the limitations to the use of new technologies; and (4) develop CAA tools for relating optical signatures of foreign spacecraft to mission activities.

(U) FY 1991 Accomplishments:
- (U) Spaceflight Plan approved for Advanced Photovoltaic Electronics Experiment (APEX) mission.
- (U) Delivered all hardware to Kennedy Space Center for the Shuttle Potential and Return Electron Experiment (SPREE).

Program Element: #0603410F Budget Activity: #2 - Advanced Technology Development
PE Title: Space Systems Environmental Interactions Technology

- (U) Obtained high-resolution ultra violet-visible spectra of shuttle engine firings from Shuttle STS-38 and 41.
- (U) Completed detector design and Langmuir probe fracture analysis for the Charging Hazards and Wake Studies (CHAWS) experiment.

(U) FY 1992 Planned Program:
- (U) Complete laboratory testing and deliver Photovoltaic Array Space Power Plus Diagnostics (PASP Plus) flight hardware for integration on Pegasus low-cost launch vehicle.
- (U) Support SPREE functional tests; launch on STS-49.
- (U) Conduct Air Force Maui Optical Station (AMOS) test program for shuttle mission STS-44.
- (U) Continue development of "fast" Spacecraft/Orbiter Contamination Representation Accounting for Transiently Emitted Species (SOCRATES) computer code.
- (U) Complete retarding potential analyzer detectors for CHAWS.
- (U) Begin preliminary design for Solar Mass Ejection Imager (SMEI).

(U) FY 1993 Planned Program:
- (U) Launch PASP Plus high-tech demonstration on Pegasus.
- (U) Complete SPREE data analysis; publish final technical report.
- (U) Complete validation of SOCRATES space contamination model.
- (U) Launch CHAWS aboard STS-59; publish preliminary results.
- (U) Complete SMEI Critical Design Review.

(U) Work Performed By: This project is managed by AFSC's Phillips Laboratory, Geophysics and Advanced Weapons & Survivability Directorates, Hanscom AFB, MA. The main contractors are: AMPTEK Inc., Bedford, MA; Panametrics, Inc., Waltham, MA; John Hopkins University Applied Physics Laboratory, Laurel, Md.; and Spectral Sciences, Inc., Burlington, MA.

(U) Related Activities:
- (U) NASA/USAF Space Technology Interdependency Group coordinates efforts and reviews programs annually.
- (U) PE 0602101F, Geophysics.
- (U) PE 0603401F, Advanced Spacecraft Technology.
- (U) PE 0603438F, Satellite Systems Survivability.
- (U) PE 0603402F, Space Test Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 2823, Charge Control System (CCS): The Air Force needs the capability to prevent electrical charge buildup and the resulting disabling discharges on its operational satellites. For high-altitude and geosynchronous spacecraft, a charge control system has been developed. The system is being integrated aboard a Defense

Program Element: #0603410F Budget Activity: #2 - Advanced Technology Development
PE Title: Space Systems Environmental Interactions Technology

Satellite Communications Satellite (DSCS) to validate the concept of autonomous active charge control and to baseline prototype engineering design. For low/medium orbit satellites, a Compact Environmental Anomaly Sensor (CEASE) is under assessment to provide warnings on space conditions likely to produce anomalous behavior.

(U) FY 1991 Accomplishments:
- (U) Completed basic design and developmental microprocessor controller, and revised CCS plasma power supply.
- (U) Fabrication is 85% complete on CCS electrostatic analyzer.

(U) FY 1992 Planned Program:
- (U) Begin CCS integration on DSCS; complete charging algorithm.
- (U) Evaluate CEASE power, weight, and packaging constraints.

(U) FY 1993 Planned Program:
- (U) Complete CCS-DSCS integration and installation on satellite.
- (U) Complete CEASE Critical Design Review; initiate brassboard unit fabrication.

(U) Work Performed By: This project is managed by AFSC's Phillips Laboratory, Geophysics Directorate, 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 Program reviews programs annually.
- (U) PE 0602101F, Geophysics.
- (U) PE 0603402F, Space Test Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603428F Budget Activity: #2-Advanced Technology Development
PE Title: Space Subsystems Technology

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 4096 Surveillance Technology Integration | 0 | 0 | 2,000 | Cont | TBD |
| 4097 Space Environment | 0 | 0 | 250 | Cont | TBD |
| 4098 Sensor Signal Processing Technology Development | 1,000 | 4,575 | 4,500 | Cont | TBD |
| 4099 Next Generation Radar Technology Demonstration | 0 | 0 | 18,051 | Cont | TBD |
| Total | 1,000 | 4,575 | 24,801 | 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 demonstration, 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 on surveillance, and the development of space phased array and signal processing technologies. The program also includes two advanced technology demonstration efforts: a series of integrated brass-board ground demonstrations; and a larger scale, space flight demonstration on an experimental x-vehicle satellite. 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 experimental payload development and integration.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN FY 1993:

1. (U) Project 4096, Surveillance Technology Integration: The project 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 complimentary adjunct sensor technology programs and demonstrations necessary for insertion into future wide area surveillance systems.

Program Element: #0603428F Budget Activity: #2-Advanced Technology Development
PE Title: Space Subsystems Technology

(U) FY 1991 Accomplishments:
- (U) None.

(U) FY 1992 Planned Program:
- (U) None.

(U) FY 1993 Planned Program:
- (U) Begin investigating 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. Access the potential interfaces needed for these potential complementary sensors.
- (U) Evaluate and integrate the Navy's complementary sensor development and demonstration program results.
- (U) Define wide area surveillance space experiments and utility demonstrations.
- (U) Begin to examine potential dual use applications (such as oceanic surface ship tracking) of possible sensor mixes.

(U) Work Performed By: Managed by the Directorate of Space and Missiles Technology of the Phillips Laboratory, Kirtland Air Force Base, NM. This a new project. Contractors have not been selected.

(U) Related Activities:
(U) PE 0602702F, Command, Control, Communications, and Intelligence.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 will be developed for both areas.

(U) FY 1991 Accomplishments:
- (U) None.

(U) FY 1992 Planned Program:
- (U) None.

(U) FY 1993 Planned Program:
- (U) Begin development of ionospheric model and mitigation technique applicable to wide area surveillance.

Program Element: #0603428F Budget Activity: #2-Advanced Technology Development
PE Title: Space Subsystems Technology

- (U) Initiate space debris characterization program in the orbits of interest to wide area surveillance.

(U) Worked Performed By: Managed by the Directorate of Space and Missile Technology of the Phillips Laboratory, Kirtland Air Force Base, NM. This is a new project. Contractors have not been selected.

(U) Related Activities:
(U) PE 0603707F, Weather Systems Advanced Development.
(U) PE 0602101F, Geophysics.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: 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 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 a 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.
- (U) Determine hardware size and performance constraints necessary to perform the extended range HAVE GAZE experiments.
- (U) Perform experiments and analyze experiment data in order to update phenomenological and space system application models for target detection and counter countermeasures.

(U) FY 1993 Planned Program:
- (U) Conduct ground test experiments to investigate the limits of HAVE GAZE technologies.
- (U) Analytically evaluate the capability of HAVE GAZE technology with conventional radar systems.
- (U) Initiate planning to integrate HAVE GAZE technology into an aircraft experiment to demonstrate target detection and tracking.

(U) Worked Performed By: Managed by the Directorate of Space and Missiles Technology of the Phillips Laboratory, Kirtland Air Force

Program Element: #0603428F Budget Activity: #2-Advanced Technology Development
PE Title: Space Subsystems Technology

Base, NM. The contractor is Research and Development Laboratories, Culver City, CA. Other contractors will be selected via competition.

(U) Related Activities:
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603428F Project Number: 4099
PE Title: Space Subsystems Technology Budget Activity: #2 - Advanced Technology Development

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

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Next Generation Radar Technology Demonstrations | 0 | 0 | 18,051 | Cont | TBD |

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) None.

2. (U) FY 1992 Planned Program:
   - (U) None.

3. (U) FY 1993 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 radio frequency (RF) feed technology development.
   - (U) Begin development of a breadboard adaptive nulling processor.
   - (U) Begin construction of breadboard antenna test article.

Program Element: #0603428F Project Number: 4099
PE Title: Space Subsystems Technology Budget Activity: #2 - Advanced Technology Development

- (U) Begin development of the advanced transmit/receive (T/R) modules for space applications.

4. (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 and Missiles Technology of the Phillips Laboratory, Kirtland AFB, NM. This is a new project. Contractors have not been selected.

E. (U) COMPARISON WITH FY 1992 DESCRIPTION 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) Multi-Command Required Operational Capability (MROC) 2-57.
- (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, 008-87R, 23 Apr 90.

G. (U) RELATED ACTIVITIES:
(U) PE 0603726F, Command, Control, Communications Subsystems Integration.
(U) PE 0602101F, Geophysics.
(U) PE 0602102F, Materials.
(U) PE 0602203F, Aerospace Propulsion.
(U) PE 0602302F, Rocket Propulsion.
(U) PE 0602702F, Command, Control, Communications.
(U) PE 0603238, Global Surveillance & Communications/Air Superiority & Defense/Precision Strike Advanced Technology Demonstrations.
(U) This project has been coordinated and fully integrated with Army, Navy, Air Force, and DARPA plans to insure nonduplication and compatibility with the integrated demonstrations.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

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

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

J. (U) MILESTONE SCHEDULE:
1. (U) Complete Ground Demonstrations FY 1997
2. (U) Space-Based Demonstrations FY 2001

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2611 Survivability Planning Analysis | 548 | 300 | 300 | Cont | TBD |
| 2612 Satellite Survivability | 9,386 | 7,484 | 3,000 | Cont | TBD |
| 2613 Ground Station/Link Survivability | 429 | 0 | 0 | Cont | TBD |
| Total | 10,363 | 7,784 | 3,300 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program performs survivability planning, modelling, analysis and concept evaluations to meet current and projected military space system survivability requirements. Develops and demonstrates technologies and prototype hardware and software, as well as, operational procedures, strategy and tactics that will provide survivability capabilities for military space systems. The program is structured to provide a balanced development of survivability capabilities for the space, ground, and communications segments of space systems. Space systems provide critical navigation, surveillance, communications and meteorological information to strategic, tactical, and special operations forces on a global basis. Since space system life cycles are long and systems cannot be modified once on orbit, survivability must be incorporated early in the design process. 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)/Miniaturized Satellite Threat Reporting System (MSTRS) and Technology for Autonomous Operational Survivability (TAOS). SOARS/MSTRS 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. TAOS is a 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 FY 1993:

1. (U) Project 2611, Survivability and Planning Analysis: Performs planning, modelling, analysis, and concept evaluation to meet current and projected space system survivability requirements.

(U) FY 1991 Accomplishments:
- (U) Continued analyses of the evolving threat, technology needs, development priorities, and operational requirements. Developed survivability investment strategy.
- (U) Continued to develop modelling and analysis tools for survivability option tradeoffs, including affects on optimum production and launch scheduling

(U) FY 1992 Planned Program
- (U) Continue analyses of evolving threat, technology needs, development priorities, and

operational requirements. Use investment strategy to create an Air Force space system survivability roadmap

- (U) Continue development of modelling and analysis tools for survivability trade studies

(U) FY 1993 Planned Program:
- (U) Update the survivability roadmap and investment strategies
- (U) Continue to develop modelling and analysis tools

(U) Work Performed By: 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. Aerospace Corp., Los Angeles, CA, provides technical assistance.

(U) Related Activities:
- (U) Program Element #0603218C, SDI Research and Support Activities
- (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 and operational concepts in support of current and projected space system survivability requirements. Satellite On-Board Attack Reporting System (SOARS)/Miniaturized Satellite Threat Reporting System (MSTRS) and Technology for Autonomous Operational Survivability (TAOS) are the major efforts.

(U) FY 1991 Accomplishments:
- (U) Completed SOARS Critical Design Review
- (U) Continued TAOS payload development and started mission rehearsals
- (U) Initiated evaluation of SOARS design with satellite program offices

(U) FY 1992 Planned Program:
- (U) SOARS program evaluation indicates existing design is too large and heavy for most applications. AF plans to terminate the existing SOARS development and redirect efforts toward the MSTRS concept studies
- (U) Complete TAOS payload development
- (U) Begin TAOS spacecraft/payload integration and testing

(U) FY 1993 Planned Program:
- (U) Award MSTRS development contract
- (U) Launch and operate TAOS on Space Test Experiment Platform (STEP) Mission 0 using DARPA's Taurus launch vehicle
- (U) Complete on-orbit operations of TAOS
- (U) Begin TAOS payload mission analysis and reporting

Program Element: #0603438F
PE Title: Satellite Systems Survivability

Budget Activity: #6 - Defense Wide Mission Support

(U) Work Performed By: SOARS/MSTRS: Space Systems Division, Los Angeles, CA, manages SOARS. The SOARS and MSTRS concept study contract is with Lockheed, Sunnyvale, CA. The Aerospace Corporation, Los Angeles, CA, provides system engineering support for SOARS. TAOS: Phillips Laboratory, Albuquerque, NM, manages the TAOS development effort. 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.

(U) Related Activities:
- (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) 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 and communications links.

(U) FY 1991 Accomplishments:
- (U) Completed Integrated Satellite Control Modeling task.

(U) FY 1992 Planned Program:
- (U) No planned activity

(U) FY 1993 Planned Program:
- (U) No planned activity

(U) Work Performed By: Space Systems Division, Los Angeles, CA. Aerospace Corp., Los Angeles, CA, provides technical assistance.

(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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603601F Budget Activity: #2 - Advanced Technology Development
PE Title: Conventional Weapons Technology

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 670A Ordnance Technology | 15,486 | 19,595 | 17,826 | Cont | TBD |
| 670B Air-to-Surface Guidance Technology | 12,745 | 9,526 | 7,893 | Cont | TBD |
| 670E Air-to-Air Guidance Technology | 200 | 1,300 | 3,611 | Cont | TBD |
| 4168 Precision Strike | 0 | 0 | 10,000 | Cont | TBD |
| Total | 28,431 | 30,421 | 39,330 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology effort 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 for advanced technologies are developed and evaluated to determine feasibility, effectiveness, and potential operational value. This program serves as the basis for follow-on system prototyping and system upgrades. Project 4168, Precision Strike begins in FY 1993. This project develops technologies for the Joint DoD Advanced Technology Demonstrations for Precision Strike. This project will develop and demonstrate advanced adverse-weather precision strike guidance technologies.

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

1. (U) Project 670B, Air-to-Surface Guidance Technology: This project develops and demonstrates advanced and autonomous, adverse-weather, near-zero circular error probability terminal guidance technologies. Objectives include: standoff delivery/threat avoidance through autonomous seeker operation, target acquisition; precision terminal guidance with increased accuracy, adverse-weather operation, and increased tactical flexibility; enhanced target classification and identification; improved countermeasures-resistant seeker capability; increased affordability; and increased tactical mission choices.

(U) FY 1991 Accomplishments:
- (U) Developed and flight tested midcourse guidance and terminal accuracy of synthetic aperture radar (SAR) seekers.
- (U) Conducted captive flight tests of Autonomous SAR Guidance (ASARG) seeker against high value fixed targets.
- (U) Conducted utility analysis, mission planning, target acquisition algorithm development, and advanced guidance study to support the Advanced Technology Laser Radar Seeker (ATLAS) seeker system.
- (U) Conducted initial ATLAS captive flight testing to demonstrate application to tactical weapons.

(U) FY 1992 Planned Program:
- (U) Conduct ATLAS captive flight test on medium speed aircraft.
- (U) Update ATLAS seeker and integrate into final configuration for pod-mounted seeker on high speed aircraft.
- (U) Collect and analyze millimeter wave (MMW) and infrared (IR) target and background data and complete antenna development for application to MMW/IR Common Aperture Seeker (MICAS).

Program Element: #0603601F Budget Activity: #2 - Advanced Technology Development
PE Title: Conventional Weapons Technology

(U) FY 1993 Planned Program:
- (U) Conduct ATLAS high speed captive flight tests to demonstrate high speed scanning and real-time processing of acquisition and terminal guidance.
- (U) Complete testing of ASARG seeker to demonstrate precision guidance capability through adverse weather conditions.

(U) Work Performed By: Wright Laboratory's Armament Directorate, Eglin AFB FL, is responsible for program management and technical activity. Test facilities at Air Force Development Test Center, Eglin Air Force Base FL, support this program. The major contractors are: Raytheon Co, Bedford MA; Loral, Phoenix AZ; General Dynamics, San Diego CA; and McDonnell Douglas, St Louis MO.

(U) Related Activities:
(U) PE 0602602F, Conventional Munitions.
(U) PE 0602111N, Anti-Air/Anti-Surface Warfare Technology.
(U) PE 0603792N, Advanced Technology Demonstrations.
(U) PE 0604407D, Joint Standoff Weapon.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (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 with evading/maneuvering characteristics. Objectives include acquisition of reduced signature targets, improved countermeasure performance, autonomous seeker operation, and precision guidance. These technical goals will allow for reduced miss distances, adverse-weather operation, increased tactical mission options, improved survivability, more reliable system operation, and enhanced affordability. Efforts are focused on a multi-spectral seeker which combines IR and radio frequency (RF) guidance technologies.

(U) FY 1991 Accomplishments:
- (U) Defined threat and developed basic system parameters for a multi-spectral (combined IR & RF) air-to-air missile seeker.
- (U) Completed in-house planning for development of a multi-spectral brassboard seeker.

(U) FY 1992 Planned Program:
- (U) Initiate a multi-spectral, air-to-air seeker (MSAAS) development program.
- (U) Complete in-house multi-spectral simulation and analysis capability to support evaluation of multi-spectral seeker performance.

(U) FY 1993 Planned Program:
- (U) Complete conceptual design of MSAAS.
- (U) Initiate fabrication of MSAAS 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 have not been selected.

Program Element: #0603601F Budget Activity: #2 - Advanced Technology Development
PE Title: Conventional Weapons Technology

(U) Related Activities:
(U) PE 0602602F, Conventional Munitions.
(U) PE 0602111N, Anti-Air/Anti-Surface Warfare Technology.
(U) PE 0603792N, Advanced Technology Demonstrations.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Ordnance Technology | 15,486 | 19,595 | 17,826 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project develops and demonstrates the feasibility, effectiveness, and operational utility 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; advanced combat ammunition; more effective submunition dispensing; low drag composite weapons airframes; increased tactical mission choices; and improved weapon performance.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Completed development of the GBU-28/B hard target penetrating munition; a Desert Storm quick reaction program.
   - (U) Conducted preliminary qualification tests for melt cast and plastic bonded explosive mixtures for IHE safety classification.
   - (U) Completed 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.
   - (U) Completed definition of parameters, technology assessments and developed design components for the air-to-air ordnance package.
   - (U) Conducted captive flight tests of the laser diode smart submunition sensor against ground clutter and countermeasures.
   - (U) Conducted testing of large diameter, smart submunition, self-forging fragment warhead.

2. (U) FY 1992 Planned Program:
   - (U) Complete component proof-of-concept testing and design form-factored components for air-to-air ordnance package.
   - (U) Initiate design of dual mode launcher capable of launching AIM-9s and AIM-120s from aircraft internal weapons bays.
   - (U) Conduct safety tests for MK-80 series and BLU-109 bombs filled with IHE.
   - (U) Conduct testing of a smart submunition multi-modal warhead.
   - (U) Initiate design of a boosted, unitary hard target penetrator suitable for internal and external carriage by existing and future aircraft.
   - (U) Complete integration testing of hard target ordnance package for defeat of buried targets and conduct system level sled tests.

Program Element: #0603601F Project Number: 670A
PE Title: Conventional Weapons Technology Budget Activity: #2 - Advanced Technology Development

3. (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) Initiate development of insensitive munitions fuze for all-up general purpose bombs.
   - (U) Conduct boosted penetrator component and subsystem sled tests.
   - (U) Fabricate dual mode launcher hardware.
   - (U) Initiate analysis of low cost inertial and terminal guidance into standoff weapon concepts.

4. (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; General Electric Co, Burlington Vt; and Orlando Technology Inc, Orlando FL.

E. (U) COMPARISON WITH FY 1992 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) TAF SON 335-88, Advanced Capability Anti Radiation, 6 Jun 90.
   - (U) TAF SON 317-87, Advanced Attack Weapon, 16 May 89.
   - (U) SAC SON 001-85, Strategic Relocatable Target Capability, 10 Jun 86.
   - (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 303-85, 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 0602111N, Anti-Air/Anti-Surface Warfare Technology.
   (U) PE 0603792N, Advanced Technology Demonstrations.
   (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

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

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

Program Element: #0603601F Project Number: 670A
PE Title: Conventional Weapons Technology Budget Activity: #2 - Advanced Technology Development

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. (U) | Completed development of Have Slick weapon airframe | 4Q 1990 |
| 2. (U) | Completed Hard Target Technology subsystem integration | 4Q 1991 |
| 3. (U) | Hard Target Ordnance Technology demonstration | 4Q 1992 |
| 4. (U) | Complete air-to-air ordnance package proof of concept | 4Q 1992 |
| 5. (U) | Complete air-to-air ordnance package form, fit function, and integration testing | 3Q 1993 |
| 6. (U) | Fabricate dual mode launcher hardware | 4Q 1993 |
| 7. (U) | Complete demonstration of insensitive general purpose bombs | 4Q 1993 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603601F
PE Title: Conventional Weapons Technology
Project Number: 4168
Budget Activity: #2 - Advanced Technology Development

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

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Precision Strike | 0 | 0 | 10,000 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This is a new effort beginning in FY 1993. This project develops technologies for the Joint DoD Advanced Technology Demonstration for Precision Strike. This project develops and demonstrates the feasibility, effectiveness, and potential operational value of advanced, adverse-weather, precision strike technologies. The objective will focus on locating and killing time critical hard and mobile targets through strike planning; and launch and delivery of standoff weapons with precision accuracy utilizing real-time targeting data both on-board and off-board the delivery aircraft capable of day/night, adverse-weather, and reduced exposure operation.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) None.

2. (U) FY 1992 Planned Program:
   - (U) None.

3. (U) FY 1993 Planned Program:
   - (U) Initiate integration of real-time targeting technology both on-board the delivery aircraft and off-board the aircraft.
   - (U) Initiate integration of weapon airframe, inertial guidance, and terminal seeker technologies.

4. (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. Contractors have not been selected.

E. (U) COMPARISON WITH FY 1992 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) TAF SON 317-87, Advanced Attack Weapon, 16 May 89.
- (U) SAC SON 001-85, Strategic Relocatable Target Capability, 10 Jun 86.
- (U) SAC SON 18-82, Strategic Conventional Standoff Capability, 19 Jun 84.
- (U) TAF SON 303-85, Hard Target Munition, 20 May 85.
- (U) Draft ORD for Joint Direct Attack Munition, Nov 91.

Program Element: #0603601F
PE Title: Conventional Weapons Technology
Project Number: 4168
Budget Activity: #2 - Advanced Technology Development

G. (U) RELATED ACTIVITIES:
(U) PE 0602102F, Materials.
(U) PE 0602201F, Aerospace Flight Dynamics.
(U) PE 0602202F, Human Systems Technology.
(U) PE 0602203A, Missile Technology.
(U) PE 0602204F, Aerospace Avionics.
(U) PE 0602602F, Conventional Munitions.
(U) PE 0602702F, Command/Control/Communications.
(U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
(U) PE 0603245F, Advanced Fighter Technology Integration.
(U) PE 0604618F, Joint Direct Attack Munition.
(U) The specific projects have been coordinated and fully integrated with Army, Navy, Air Force, and DARPA plans to insure non-duplication and compatibility with the integrated demonstrations.

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

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

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. | (U) Initiate real-time targeting integration development | 1Q 1993 |
| 2. | (U) Initiate airframe, guidance, and seeker integration | 1Q 1993 |
| 3. | (U) Complete real-time targeting integration | 2Q 1994 |
| 4. | (U) Conduct captive flight test of instrumented airframe | 4Q 1994 |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3150 High Energy Laser and Optics Technology | 4,978 | 6,516 | 7,900 | Cont | TBD |
| 3151 Phased Integrated Laser Optics Technology (PILOT) | 16,313 | 16,881 | 13,541 | Cont | TBD |
| 3152 High Power Microwave Technology | 9,410 | 13,651 | 11,200 | Cont | TBD |
| 3277 Systems Survivability | 478 | 497 | 400 | Cont | TBD |
| 3647 Ground Based Laser Technology | 22,561 | 23,007 | 21,796 | Cont | TBD |
| Total | 53,740 | 60,552 | 54,837 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is the advanced technology development program for directed energy (DE) concepts and advanced optical imaging systems for Air Force applications. Major technology breakthroughs in removing distortions from laser beams and other optical transmissions which pass through the atmosphere, in producing high resolution optical imagery from distant objects, in fabricating phased arrays of small high power laser diodes, and in understanding the effects of high power microwave (HPM) radiation 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, moderate power laser diode arrays, and the effects of DE and nuclear weapons on U.S. systems.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN FY 1993:

1. (U) Project 3150, High Energy Laser & Optics Technology: The focus of this project has evolved due to changes in the world situation and changes due to various laboratory consolidation actions. Currently the project has increased emphasis on advanced optical imaging technologies for distant objects. Most of this work directly supports high energy lasers as an imaging subsystem and is required for accurate placement and maintenance of the laser beam on the target and for damage assessment. Advanced techniques; including nonlinear optics (NLO), adaptive optics and special signal processing; support high quality optical image reconstruction through a turbulent atmosphere for ground, airborne, or space based sensors. Many of these technologies have significant application to astronomy research in both techniques and hardware.

Program Element: #0603605F Budget Activity: #2-Advanced Technology Development
PE Title: Advanced Weapons Technology

(U) FY 1991 Accomplishments:
- (U) Demonstrated passive imaging system which doubled the performance of the compensated imaging system at the Air Force Maui Optical Site.
- (U) Completed development of sensor for high resolution passive imaging.
- (U) Developed and evaluated illuminator for active imaging.
- (U) Used nonlinear optics (NLO) to couple several laser diodes via optical fibers and demonstrate self-alignment.
- (U) Started fabrication of NLO imaging brassboard for first real-time image distortion removal.

(U) FY 1992 Planned Program:
- (U) Demonstrate high resolution imaging techniques, in the laboratory, for daytime space object identification applications.
- (U) Demonstrate pre-compensated passive imaging for advanced tracking and aimpoint maintenance applications.
- (U) Complete the transfer of technology for passive imaging for operational applications at the Air Force Maui Optical Station.
- (U) Perform field test to acquire satellites and sky background data in preparation for daytime satellite imaging demonstration.
- (U) Field test NLO imaging brassboard for first real time image distortion removal

(U) FY 1993 Planned Program:
- (U) Evaluate advanced high resolution passive space object imaging techniques on 3.5 meter telescope.
- (U) Demonstrate new generation imaging sensor.
- (U) Field demonstration of daytime satellite imaging.
- (U) Begin NLO imaging brassboard rlight program and end-to-end demonstration of atmospheric compensation applied to an airborne imaging system.

(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: ATA Corp, Albuquerque, NM; Rockwell Power Services Co, Albuquerque, NM; R&D Associates, Marina del Rey, CA; S Systems Corp, Inglewood, CA; and University of Arizona, Optical Sciences Center, Tucson, AZ.

(U) Related Activities:
- (U) PE 0602601F, Advanced Weapons.
- (U) PE 0603217C, Follow-on Systems.
- (U) PE 0602102F, Materials.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

Program Element: #0603605F
PE Title: Advanced Weapons Technology

Budget Activity: #2-Advanced Technology Development

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (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 1991 Accomplishments:
- (U) Completed development of specific nuclear hardening techniques for ground systems.

(U) FY 1992 Planned Program:
- (U) Develop and test improved nuclear simulation field test measurement, recording, and reduction systems.

(U) FY 1993 Planned Program:
- (U) Demonstrate distributed switch for more realistic rapid risetime simulation.

(U) Work Performed By: The Advanced Weapons and Survivability Directorate of the Phillips Laboratory, Kirtland Air Force Base, NM manages this program. No contracts have 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Phased Integrated Laser Optics Technology (PILOT) | 16,313 | 16,881 | 13,541 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The PILOT project transitions a revolutionary breakthrough in compact, robust, low-cost laser systems technology to development for a wide range of military applications which require low to moderate power optical sources. Employing semiconductor lasers, PILOT builds upon and enhances the advancements being made by the semiconductor industry. Commercially available semiconductor lasers (1/10 watt) are widely used in the industrial community because of their low cost, small size and weight, high reliability, and high efficiency in converting electricity to laser light. The PILOT project preserves these attractive features while scaling to the higher powers (1 - 10 watts and above) necessary for military applications. The PILOT program is divided into three integrated research areas. First, it investigates methods of increasing the output from individual semiconductor lasers. Second, it develops methods of combining the individual lasers and other semiconductor elements into an array producing a single, high quality laser beam. And third, PILOT is investigating methods to produce these lasers at a variety of wavelengths to meet the specific requirements of the military applications.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Planned Program:
   - (U) Demonstrated 4 watt very high beam quality resonant optical cavity breadboard laser.
   - (U) Demonstrated 50 watts output power from a 1 square centimeter on a semiconductor wafer.
   - (U) Demonstrated fabrication of laser diode array on gallium arsenide (GaAs) wafers with a 100 times yield improvement.
   - (U) Completed study and transitioned low power devices for field demonstrations.
   - (U) Demonstrated first laser diode operating in the mid-infrared.

2. (U) FY 1992 Planned Program:
   - (U) Demonstrate producibility o high quality, coherent, end-to-end coupled and side-to-sic coupled laser diode arrays to allow and investigate the viability of mass production of these components.

Program Element: #0603605F
PE Title: Advanced Weapons Technology
Project Number: 3151
Budget Activity: #2-Advanced Technology Development

- (U) Couple four subscale diode arrays to form a two-dimensional diode module.
- (U) Demonstrate 25 watt resonant optical cavity system.
- (U) Demonstrate a 2 watt single laser diode building block for arrays.
- (U) Build world's first mid-infrared semiconductor laser array, producing 10 watts output.
- (U) Deliver demonstration device for field medical treatment evaluation to Air Force Pararescue and Armstrong Laboratory.

3. (U) FY 1993 Planned Program:
   - (U) Demonstrate 30-50 watt high quality laser beam from combined modules of phased arrays of laser diodes.
   - (U) Incorporate PILOT array coupling and cooling techniques into semiconductor laser arrays which operate in the mid-infrared to greatly improve their laser beam quality while maintaining high output power.
   - (U) Transition PILOT technology to active denial and tactical users for field testing for short range applications.

4. (U) Program to Completion:
   - (U) This is a continuing program.
   - (U) Develop 10 watt single devices as "building blocks" for PILOT arrays.
   - (U) Demonstrate 20 watt semiconductor lasers at a variety of wavelengths, especially infrared.
   - (U) Continue to transition PILOT technology to applications with increasing power and wavelength requirements.

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-Danbury Optical Systems Danbury, CT.

E. (U) COMPARISON WITH FY 1992 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 MAC 003-87, 20 Sep 89, Air Force Special Operations Forces (AFSOF) Aircraft Intraformation Positioning System (IFPS).
   - (U) SON SAC 025-87, 13 Feb 89, Denial Systems for Nuclear Weapons Security.
   - (U) SON TAF 312-88, 20 Sep 89, Follow On Close Air Support (CAS)

Program Element: #0603605F
PE Title: Advanced Weapons Technology
Project Number: 3151
Budget Activity: #2-Advanced Technology Development

Aircraft.
- (U) SON TAF 323-88, 6 Nov 89, Advanced Infrared Countermeasures for TAF Aircraft.
- (U) SON TAF 327-88, 6 Nov 89, Dispersed Weapons Systems Security.
- (U) SON MAC 004-89, 6 Oct 89, MC-130P/N and C-130 AWADS SOLL II SOF Improvements.
- (U) SON AFSPACECOM 005-89, Follow-on to the Defense Satellite Communications System (DSCS).

G. (U) RELATED ACTIVITIES:
(U) PE 0602601F, Advanced Weapons.
(U) PE 0602204F, Aerospace Avionics.
(U) PE 0603250F, Lincoln Laboratory.
(U) PE 0603223C, Systems & Battle Management
(U) PE 0602234N, Systems Support Technology
(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) Joint field demonstrations of PILOT technology are ongoing with: the USAF Pararescue School; the Air Force Special Operations Command; the US Coast Guard; and the US Customs Service.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

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

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

J. (U) MILESTONE SCHEDULE:

| | | | |
|---|---|---|---|
| 1. | (U) | 40 Watt (W) High Quality Laser Beam Arrays | FY 1993 |
| 2. | (U) | 10 W Single Device Array Building Blocks | FY 1993 |
| 3. | (U) | 100 W High Quality Laser Beam Arrays | FY 1994 |
| 4. | (U) | 10 W High Quality Mid-infrared Arrays | FY 1994 |
| 5. | (U) | 500 W High Quality Laser Beam Arrays | FY 1996 |
| 7. | (U) | 20 W High Quality Mid Infrared Arrays | FY 1996 |
| 8. | (U) | 1000 W PILOT Demonstration | FY 1997 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603605F
PE Title: Advanced Weapons Technology
Project Number: 3152
Budget Activity: #2-Advanced Technology Development

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

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| High Power Microwave (HPM) Technology | 9,410 | 13,651 | 11,200 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: 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 decisions. Representative US and foreign systems and subsystems will be tested to determine their susceptibilities. Both wideband (wide range of frequencies) and narrow band (very small range of frequencies) systems are being addressed.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Developed gigawatt wideband pulser for effects testing.
   - (U) Conducted low power microwave testing on F-16 testbed for first evaluation of HPM against fly-by-wire technology.
   - (U) Completed construction of High Energy Research and Technology Facility and the High Energy Microwave Laboratory.
   - (U) Phase-locked five split cavity oscillators; key technology leading to modular high power system.

2. (U) FY 1992 Planned Program:
   - (U) Begin development of compact driver to evaluate practicality of airborne high power microwave sources.
   - (U) Complete 1 kilojoule repetitively pulsed device essential for field testing and technology transition.
   - (U) Complete high power solid state microwave source module and begin array development.
   - (U) Begin high power testing of F-16 testbed, in particular the fly-by-wire technology.
   - (U) Explore a new high power radiofrequency technique.
   - (U) Complete the design of a gigawatt class solid state HPM array.
   - (U) Deliver a 5 megawatt magnetohydrodynamic (MHD) generator as a prime power source and develop and test key components for a 20 megawatt portable MHD generator.

3. (U) FY 1993 Planned Program:
   - (U) Complete assessment of F-16 testbed to HPM.

Program Element: #0603605F
PE Title: Advanced Weapons Technology
Project Number: 3152
Budget Activity: #2-Advanced Technology Development

- (U) Complete high power solid state array HPM device to explore weaponization.
- (U) Complete development of compact high power microwave source.
- (U) Complete target characterization for aircraft self-protection technology demonstration.
- (U) Provide HPM hardening recommendations for LANTIRN and F-16.

4. (U) Program to Completion:
   - (U) This is a continuing program.
   - (U) Continue HPM effects assessments on AF and foreign systems.
   - (U) Ultra-wideband source and antenna development will continue.
   - (U) Specific narrowband source and antenna development will continue.
   - (U) Develop tunable high power microwave source for effects testing and waponization evaluation.
   - (U) Technology development for applications such as access denial, aircraft self protection, etc will continue.

D. (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: Maxwell Laboratories, San Diego, CA; Kaman Sciences Corp, Dikewood Division, Albuquerque, NM; Mission Research Corporation, Santa Barbra, CA; Fiore Industries, Albuquerque, NM; and Power Spectra Inc., Fremont, CA.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Not Applicable.
2. (U) SCHEDULE CHANGES: Not Applicable.
3. (U) COST CHANGES: $4.4 million was appropriated for FY 1992 for magnetohydrodynamic power generator development.

F. (U) PROGRAM DOCUMENTATION:
   - (U) SON TAF 323-88, 6 Sep 89, Advanced Infrared Countermeasures for TAF Aircraft.
   - (U) SON TAF 341-88, 30 Oct 89, Radio Frequency Countermeasures.
   - (U) SON SAC 010-89, 14 Jul 89, draft, Bomber Lethal Penetration Aids.
   - (U) SON MAC 007-81, 24 May 82, Defensive Systems for Airlifter Aircraft.
   - (U) SON SAC 025-87, 15 Feb 89, Denial Systems for Nuclear Weapons Security.
   - (U) MNS SAC 025-87, Jan 92, Denial Systems for Nuclear Weapon Security.

G. (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.

Program Element: #0603605F
PE Title: Advanced Weapons Technology
Project Number: 3152
Budget Activity: #2-Advanced Technology Development

(U) PE 0602120A, Electronic Survivability and Fuzing Technology.
(U) PE 0602111N, Anti Air Warfare, Anti Surface Warfare Technology.
(U) PE 0602202F, Human Systems Technology.
(U) PE 0603737D, Balanced Technology Initiative.
(U) PE 0602601F, Advanced Weapons.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

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

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

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. | (U) LANTIRN System Assessment | FY 1995 |
| 2. | (U) Critical experiment for Access Denial | FY 1995 |
| 3. | (U) High Power Wideband Antenna | FY 1996 |
| 4. | (U) Large 2-D Solid State Phased Array | FY 1996 |
| 5. | (U) Aircraft Self Protection Experiment | FY 1997 |
| 6. | (U) 10 Kilojoule Lightweight HPM System | FY 1997 |
| 7. | (U) Air Defense Suppression Experiment | FY 1998 |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Ground Based Laser (GBL) Technology | 22,561 | 23,007 | 21,796 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project develops and demonstrates technology and conducts detailed system assessments needed for a ground based laser (GBL) antisatellite (ASAT) weapon. The project will develop and use detailed system models to establish laser system effectiveness and 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 astronomy community.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Evaluated advanced oxygen generator and nozzle concepts for a chemical oxygen iodine laser (COIL) device on a scaled laboratory testbed.
   - (U) Completed moderate-scale laser testing and evaluation of an innovative concept for cooled high energy laser optics.
   - (U) Completed coupled resonator experiment to establish feasibility as a modular scaling path for high energy lasers.
   - (U) Completed 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) Installed and begin field check-out of a 1 meter beam director to support active tracking and imaging field experiments.
   - (U) Completed the fabrication of the 3.5 meter telescope for full scale beam control development and demonstration.
   - (U) Completed update of satellite vulnerability assessments for high priority targets.

2. (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.

Program Element: #0603605F
PE Title: Advanced Weapons Technology

Project Number: 3647
Budget Activity: #2-Advanced Technology Development

- (U) Activate 3.5 meter telescope and begin development of first generation beam train and 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) Perform satellite vulnerability assessments for additional targets and establish better lethality criteria for lasers.
- (U) Begin analysis to evaluate implications of aimpoint designation and maintenance requirements based on satellite vulnerability assessments.

3. (U) FY 1993 Planned Program:
   - (U) Begin development of second generation adaptive optics for 3.5 meter telescope.
   - (U) Activate 3.5 meter telescope and begin field check out of first generation adaptive optics.
   - (U) Begin development of scaled laser device 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) Complete 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 assessments.

4. (U) Program to Completion:
   - (U) This is a continuing program.
   - (U) Further develop specific component technologies.
   - (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 an OSD decision for GBL ASAT.

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.

Program Element: #0603605F
PE Title: Advanced Weapons Technology
Project Number: 3647
Budget Activity: #2-Advanced Technology Development

E. (U) COMPARISON WITH FY 1992 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) Mission Need Statement (MNS) for Space Control Antisatellite Capability, 19 May 88, (S).
- (U) Acquisition Decision Memorandum (ADM), Antisatellite Systems, 6 Mar 89, (S).
- (U) USSPACECOM Antisatellite Concept of Operations (CONOPS), 12 Oct 89, (S).
- (U) Requirements for an ASAT Program, MJCS 201-86, Joint Chiefs of Staff, 22 Sep 88, (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 88, (S).

G. (U) RELATED ACTIVITIES:
(U) PE 0602601F, Advanced Weapons.
(U) PE 0102424F, SPACETRACK
(U) PE 0603217C, Follow-on Systems.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

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

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

J. (U) MILESTONE SCHEDULE:

| | |
|---|---|
| 1. (U) Activate 3.5 Meter Telescope | FY 1993 |
| 2. (U) Atmospheric Compensation Uplink Demo | FY 1994 |
| 3. (U) Install Full Scale Adaptive Optics And Beam Control Components | FY 1994 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603617F Budget Activity: #4 - Tactical Programs
PE T itle: Command, Control & Communications (C3) Applications

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2314 Tactical Air Surveillance | 1,809 | 100 | 100 | Cont | TBD |
| 2317 Tactical Air Information Production & Distribution | 1,971 | 100 | 900 | Cont | TBD |
| 2321 Tactical Battle Information Management | 3,933 | 2,880 | 2,900 | Cont | TBD |
| 3804 Tactical Air Forces Systems Integration | 100 | 100 | 200 | Cont | TBD |
| Total | 7,813 | 3,180 | 4,100 | 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 developed through evolutionary acquisition methods.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 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 1991 Accomplishments:
- (U) Began development of solid state power panel for the AN/TPS-75 transmitter.
- (U) Completed multiple sidelobe and mainlobe noise canceller (MSLC/MLC) improvement analyses for AN/TPS-75 radar.
- (U) Completed analysis of non-radar and/or adjunct radar sensors.

(U) FY 1992 Planned Program:
- (U) Continue solid state transmitter panel development and testing planning.
- (U) Publish final technical report on MSLC/MLC Study and Design for Radar Set AN/TPS-75.

(U) FY 1993 Planned Program:
- (U) Complete solid state transmitter panel development and

testing plans.
- (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. Westinghouse Electric Corp., Baltimore MD and PAR Government Systems/Sensis Corp., New Hartford NY/Syracuse NY support the radar technology development efforts.

(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 in support of Theater Battle Management (TBM) command and control enhancements, including multi-level security (MLS), survivability, and deployability.

(U) FY 1991 Accomplishments:
- (U) Completed test plans and preparation of integrated test facilities at Rome Laboratory (RL).
- (U) Completed Enhanced Multinet Gateway (EMG) prototypes and delivered eight to Rome Laboratory.
- (U) Started EMG testing.

(U) FY 1992 Planned Program:
- (U) Complete EMG testing and transfer to the Technology Insertion Center at Scott AFB IL for evaluation.

(U) FY 1993 Planned Program:
- (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).

Program Element: #0603617F Budget Activity: #4 - Tactical Programs
PE Title: Command, Control & Communications (C3) Applications

(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 1991 Accomplishments:
- (U) Completed development of the APS final evolutionary prototype and the first functional prototype.
- (U) Continued APS IV&V and initiated efforts to install APS into the TAF theaters.
- (U) Continued APS/CTAPS integration.

(U) FY 1992 Planned Program:
- (U) Begin full installation of APS in TAF theaters.
- (U) Provide preliminary Functional Common Core software to TAF theaters for interim use.
- (U) Begin Program Management Responsibility Transfer to HQ TAC and supporting command.

(U) FY 1993 Planned Program:
- (U) Complete installation of APS in TAF theaters, including PACAF & USAFE.
- (U) Complete PMRT of APS.
- (U) Begin planning for combat operations automation prototype (FLEX) development.

(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.

Program Element: #0603617F Budget Activity: #4 - Tactical Programs
PE Title: Command, Control & Communications (C3) Applications

(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: This project addresses system level issues associated with integration of C3I elements with command and control enhancements to Theater Battle Management (TBM) systems.

(U) FY 1991 Accomplishments:
- (U) Initiated a long-term multi-level security (MLS) insertion plan for the TAF and the development community.

(U) FY 1992 Planned Program:
- (U) Complete the long-term MLS plan.
- (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.

(U) Related Activities:
(U) PE #0603250F, Lincoln Laboratory.
(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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2688 Battlefield Weather Observation and Forecast System (BWOFS) | 3,256 | 3,128 | 2,782 | Cont | TBD |
| 2781 Next Generation Weather Radar (NEXRAD) | 443 | 400 | 400 | Cont | TBD |
| 4026 Environmental Technology Transition (ETT) | 1,872 | 2,005 | 2,100 | Cont | TBD |
| Total | 5,571 | 5,533 | 5,282 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program provides demonstrated technologies to improve environmental support programs critical to the success of Air Force and Army missions. The program goal is to provide the capability to exploit environmental conditions for mission enhancement, especially in support of combat operations worldwide. Technologies developed here feed into counterpart projects in PE 64707F, Weather Systems Engineering Development, for full scale development

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

1. (U) Project 2688, Battlefield Weather Observation and Forecast System: Improves the Air Force's ability to gather, integrate, and forecast target weather information in data-denied battle areas. Develop tactical automated weather sensors. Develop techniques to fuse weather data from different sources and times into a single analysis critical to support the tactical battlefield. Develops Electro-Optical Tactical Decision Aids (EOTDAs) to predict how weather conditions affect the performance of television, infrared, or laser sensors and other electro-optical systems. These computer models and algorithms will provide the capability to plan and optimize use of smart weapons systems by exploiting environmental conditions.

(U) FY 1991 Accomplishments:
- (U) Demonstrated visibility and cloud sensors for automated weather observing.
- (U) Completed physical model of generic building target, and continued modeling other targets, sensors, and backgrounds for EOTDAs.
- (U) Developed techniques and procedures for analyzing fused weather data.

(U) FY 1992 Planned Program:
- (U) Complete weather data fusion effort for battlefield weather analysis.
- (U) Complete testing of target detection criteria for EOTDAs.
- (U) Begin development of EOTDA validation plan.

- (U) Begin addition of Defense Mapping Agency (DMA) models for EOTDAs.
- (U) Begin development of air-refueling TDA.
- (U) Begin development of tactical automated weather detection sensors.

(U) FY 1993 Planned Program:
- (U) Demonstrate prototype EOTDA-DMA model.
- (U) Implement target detection criteria in EOTDAs.
- (U) Complete testing of automated visibility/cloud sensor.
- (U) Demonstrate tactical present weather sensor.

(U) Work Performed By: This project is managed by the Geophysics Directorate 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; ST Systems Corp., Lanham MD; University of California at San Diego, San Diego CA; Battelle Labs, Columbus OH; DOT/Transportation Systems Center, Cambridge, MA.

(U) Related Activities:
(U) Program Element 0305111F, Weather Service.
(U) Program Element 0305160F, Defense Met. 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 will improve our ability to observe and forecast severe weather such as wind shear, tornadoes, and hail, and allow us to better protect valuable combat assets.

(U) FY 1991 Accomplishments:
- (U) Completed wind discontinuity and non-severe weather tracking algorithms.
- (U) Started severe icing detection technique.
- (U) Started automated hail prediction technique.

(U) FY 1992 Planned Program:
- (U) Begin tropical storm tracking and intensity specification techniques.

Program Element: #0603707F Budget Activity: #2 - Advanced Technology Development
Title: Weather Systems Advanced Development

(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 Eng. Devel.
(U) Joint DOD/DOC/DOT Next Generation Weather Radar Prgm.
(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 atmosphere, ionosphere, and magnetosphere that will satisfy Air Force requirements for environmental observing and forecasting support to weapons/systems operating in adverse natural environments. 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 1991 Accomplishments:
- (U) Began viewing-angle bias correction for visible satellite sensors.
- (U) Began neutral atmospheric model for the 140-250km altitude range.
- (U) Completed sensitivity study of ionospheric coupling with neutral density.
- (U) Completed tropical cyclone windspeed specification algorithm.

(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 advanced physics cloud forecasting model.

(U) FY 1993 Planned Program:
- (U) Complete magnetospheric forecasting model.
- (U) Develop ionosphere/thermosphere electrodynamic model and couple with neutral atmospheric models.

Program Element: #0603707F Budget Activity: #2 - Advanced Technology Development
Title: Weather Systems Advanced Development

- (U) Develop parameterizations for solar wind transport algorithms.
- (U) Complete Wide-Band Scintillation model.
- (U) Begin development of battlefield scale forecast models.

(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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 0001 USAFE/SAC Physical Security Equipment - Exterior | | | | | |
| | -0- | 737 | 600 | 16097 | 17434 |
| Total | -0- | 737 | 600 | 16097 | 17434 |

B. (U) BRIEF DESCRIPTION OF ELEMENT: 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, delays or denies unauthorized access to secured assets and permits increased mobility of the forces for better use of existing manpower. This program element supports the advanced development of the DoD Base and Installation Security System, a standardized set of components, interfaces and methodology for creation of exterior physical systems, by accomplishing advanced development tasks in the two functional areas of detection and denial.

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

1. (U) Project 0001, USAFE/SAC Physical Security Equipment - Exterior: The budget year funds for this project provide advanced development efforts for a family of man-portable sensor devices that will detect intruders at a ranges of approximately 30 meters and report intrusion and status of alarms to either hand held or fixed base monitors by radio transmission. Key system features include synthesized radio frequencies, multiple sensor codes, continuous communications link integrity monitoring and operator commandable sensor status checking capability. The equipment will emphasize portability and minimum manpower requirements for air base ground defense missions and for protecting both dispersed weapon system and fixed base resources. The "To complete" funds for this project accomplish advanced development work for the denial program. It will integrate newly developed and existing non-developmental items (NDI) into a system capable of incrementally delaying the approach to and ultimately denying an adversary access to high value military resources. The system will include both passive and command activated barrier or weapon subsystems which will be fully integrated with existing and planned physical security systems. Denial systems will be initially applied to weapon storage areas.

(U) FY 1991 Accomplishments: Not Applicable.

Program Element: #0603714F Budget Activity: #4 - Tactical Programs
PE Title: DOD Physical Security Equipment - Exterior

(U) FY 1992 Planned Program:
- (U) Perform a sensor system requirements analysis.
- (U) Perform market survey for sensor system NDI candidates
- (U) Perform laboratory evaluation of the one more NDI sensor system candidates.

(U) FY 1993 Planned Program:
- (U) Perform sensor system demonstration of one or more candidate NDI solutions.
- (U) Prepare sensor system technical analysis, cost estimate and recommendation for user decision.
- (U) Based on user decision, begin preparation of sensor system acquisition documentation for either engineering and manufacturing development (EMD) or commercial item procurement.
- (U) Perform requirements analysis for denial systems project.

(U) Work Performed By: This projects are managed by the Electronic Security and Communications Center of Excellence, Hanscom AFB, MA. Sensor system and denial systems contractors for Dem/Val and/or EMD are to be determined. Either Analytical Systems Engineering Corp., Bedford, MA, or Horizons Technology, Inc., Billerica, MA, will assist with systems engineering support and integration tasks.

(U) Related Activities:

(U) Program Element 0604715F, DOD Physical Security Equipment - Exterior.
(U) Program Element 0207588F, Air Base Ground Defense.
(U) Program Element 0207589F, Electronic Security Equipment.
(U) Program Element 0603228D, DoD Physical Security Equipment.
(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:

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | -0- | 0 | 533 | 9,000 | 9,533 |
| Qty | Several items, various quantities. | | | | |

(U) International Cooperative Agreements: Not Applicable.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2103 Environmental Quality Technology | 3,433 | 2,236 | 2,156 | Cont | TBD |
| 2104 Civil Engineering Technology | 5,450 | 7,400 | 6,979 | Cont | TBD |
| 3037 Noise & Sonic Boom Impact Technology | 2,188 | 3,400 | 2,149 | Cont | TBD |
| Total | 11,071 | 13,036 | 11,284 | 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 a chemical/biological or conventional attack; (2) develop AF-unique environmental technology to comply with state/national/international law and allow the AF to maintain readiness, conduct realistic combat training, and deploy new weapon systems; and (3) apply cost-effective advances in civil engineering technologies. The Environmental Quality Technology goals are: a 50 percent reduction in hazardous waste generation resulting in a $13 million/year savings in AF operations and maintenance costs; cost-effective control technology for industrial emissions from aircraft painting operations resulting in a $6M savings annually; and a 95 percent faster emergency downwind hazard corridor prediction for disaster response. The Civil Engineering Technology goals are: wartime survivability of mission critical facilities and utilities; air base battle damage assessment in minutes instead of hours; rapid repair of essential facilities, utilities, and aircraft operating surfaces; and 100 percent improvement in post-attack fire suppression and crash rescue. The Noise Sonic Boom Impact Technology goal is to evaluate the impact of noise from aircraft operations.

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

1. (U) Project 2103, Environmental Quality Technology: This project develops and validates advanced technologies to address environmental restoration problems, reduce hazardous emissions from weapon systems, minimize industrial waste, and eliminate toxic pollutant releases from AF operations.

(U) FY 1991 Accomplishments:
- (U) Developed methods to reduce toxic waste generated by chromium electroplating of aircraft parts.
- (U) Evaluated ways to reduce hazardous waste from depleted uranium munition tests.
- (U) Demonstrated cone penetrometer technology for site remediation.

(U) FY 1992 Planned Program:
- (U) Develop recycling technology to recover metals from industrial sludges.
- (U) Develop in-process system for treating and recycling electroplating bath solutions.
- (U) Demonstrate alternative processes that do not produce electroplating wastes.

Program Element: #0603723F Budget Activity: #2 - Advanced Technology
PE Title: Civil & Environmental Engineering Technology Development

(U) FY 1993 Planned Program:
- (U) Develop alternative paint stripping techniques to eliminate waste.
- (U) Demonstrate supercritical fluid oxidation of rocket propellants.
- (U) Develop air-mobile shelters to protect equipment at "bare base" installations.

(U) Work Performed By: The Air Force Civil Engineering Laboratory, Tyndall AFB FL, manages this program. Contractors are: EG&G, Idaho Falls ID; ACUREX, Mountain View CA; Martin Marietta, Denver CO; ASI, Albuquerque NM; and Mountain States Engineering, Butte MT.

(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) This project has been coordinated through Project Reliance process to harmonize efforts and eliminate duplication.

(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, and perform crash rescue and suppression of aircraft and post-attack fires.

(U) FY 1991 Accomplishments:
- (U) Developed mat anchors for folded fiberglass runway mats that were delivered for Operation Desert Storm.
- (U) Completed full-scale boiler study using JP-8 fuel.
- (U) Demonstrated ability of Aqueous Film-Forming Foam to form protective seal over fuel after subsurface injection into burning storage tanks.
- (U) Identified the response of air base structures to enhanced blast weapons.
- (U) Tested armored firefighting vehicle and new firefighting agents to meet the threat of oil-filled trenches.

(U) FY 1992 Planned Program:
- (U) Develop chemical/biological agent filter for air base structure ventilation and air conditioning systems.
- (U) Demonstrate a lightweight, efficient mobile heat pump for mobility deployment.
- (U) Develop and integrate designs for modular hardened shelters.
- (U) Complete assessment of firefighting response to large frame aircraft (e.g. C-5 aircraft) fires.

(U) FY 1993 Planned Program:
- (U) Demonstrate an automated utility damage assessment technique for petroleum, oil, and lubricants (POL) storage and distribution networks.

Program Element: #0603723F Budget Activity: #2 - Advanced Technology Development
PE Title: Civil & Environmental Engineering Technology

- (U) Develop design criteria for energy cogeneration and thermal storage.
- (U) Develop an advanced system analyzer to assess the quality of pavements.
- (U) Demonstrate automatically aimed agent dispersing turret for crash/rescue vehicles.

(U) Work Performed By: The Air Force Civil Engineering Laboratory, Tyndall AFB FL, manages this program. Contractors are: Applied Research Associates, Albuquerque NM; New Mexico Engineering Research Institute, Albuquerque NM; EML Research, Hudson NH; Research Associates of Syracuse, Syracuse NY; and Harris Group, Reston VA.

(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 assessment and prediction technology to evaluate impact of noise from subsonic and supersonic aircraft operations. As directed by the National Environmental Policy Act, the AF 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.

(U) FY 1991 Accomplishments:
- (U) Incorporated national data bases into an updated Assessment System for Aircraft Noise (ASAN) model.
- (U) Completed studies to test the effects of aircraft noise on pregnant mares and on the milk production of dairy cattle.
- (U) Completed third version of International Bibliography on aircraft noise and provided copies to NATO.

(U) FY 1992 Planned Program:
- (U) Complete model to assess noise effects on grazing animals.
- (U) Develop model to assess cumulative effects of sonic booms on plaster.
- (U) Develop system requirements for a miniaturized human noise monitor.

(U) FY 1993 Planned Program:
- (U) Complete ASAN tests at major command facilities.
- (U) Incorporate ASAN databases and prediction models for structures, animals, and human annoyance.
- (U) Initiate aircraft noise/sleep disturbance study.

Program Element: #0603723F Budget Activity: #2 - Advanced Technology
PE Title: Civil & Environmental Engineering Technology Development

(U) Work Performed By: The Armstrong Laboratory, Brooks AFB TX, manages this 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603726F Budget Activity: #2-Advanced Technology Development
PE Title: C3I Subsystem Integration

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2810 Advanced Cartographic Applications | 1,307 | 1,688 | 1,760 | Cont | TBD |
| 2863 Integrated Photonics | 4,781 | 5,070 | 4,880 | Cont | TBD |
| 3192 Strategic/Tactical Optical Disk Systems (S/TODS) | 2,667 | 2,725 | 2,810 | Cont | TBD |
| 4171 Advanced EHF Communications Satellite Technology Demonstration | 0 | 0 | 2,000 | Cont | TBD |
| 4181 Advanced Surveillance Satellite Technology Demonstration | 0 | 0 | 2,000 | Cont | TBD |
| Total | 8,755 | 9,483 | 13,450 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Science and Technology program develops and demonstrates C3I technologies in the areas of spatial data manipulation of digital cartographic databases, photonics technology, optical disk storage/processing of digital information, and advanced extremely high frequency satellite communications (EHF SATCOM) terminal technology. Advanced cartotographic technology development provides a common USAF state-of-the-art cartographic application for situational awareness on all operational, planning, and intelligence systems. Photonics, the use of light (photonic) signals, technology provides a small size, high performance/capacity, and a survivable alternative to electronic technology in order to improve tactical and strategic systems, especially in the area of communications. Optical disk systems technology provides a low-cost, high density data storage capability that meets the high performance demands required by current and future C3I systems for near-real-time information processing. Advanced SATCOM terminal technology will provide survivable and enduring communications in a high threat environment by operating in the EHF communications band. These technologies provide increased storage, processing, and transmission of digital data that contains unlimited data content, such as for the cartographic global grid data. Projects 4171 and 4181, which begin in FY 1993, support the DoD Global Surveillance and Communications and Precision Strike Advanced Technology Demonstration initiatives.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN 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 spatial data relating to earth surface topology (terrain, threat, and feature 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

Program Element: #0603726F Budget Activity: #2-Advanced Technology Development
PE Title: C3I Subsystem Integration

digitally processed spatial data products which contain positional information of earth surface topology. Project milestones, demonstrations, and transitions are directly responsive to validated requirements of Air Force users and system developers.

(U) FY 1991 Accomplishments:
- (U) Initiated development of unit-level intelligence cartographic software for demonstration in the Sentinel Byte testbed.
- (U) Demonstrated fully transportable software to generate sensor and threat displays for intelligence and mission planning.
- (U) Initiated development of software to interface digital cartographic data and applications into the Strategic Air Command Intelligence Network (SACINTNET).

(U) FY 1992 Planned Program:
- (U) Demonstrate initial Common Mapping System (CMS) Standard Cartographic Mode capability for the Relational Analysis of Internetted Leakages Subsystem (RAILS) on SACINTNET.
- (U) Demonstrate a Common Mapping System (CMS) baseline unit level intelligence cartographic capability for the Sentinel Byte Worldwide Intelligence Network.
- (U) Begin development to provide user options within standardized cartographic applications to optimize system performance.
- (U) Implement Advanced Cartographic Application (ACA) Configuration Management Tool to track software development, changes, and documentation.

(U) FY 1993 Planned Program:
- (U) Demonstrate the upgraded prototype of the CMS cartographic database and applications interface for the Extended Intelligence Data Base (XIDB) on the operational SACINTNET.
- (U) Transition CMS standardized cartographic data/applications server capabilities to the unit-level Sentinel Byte Testbed.
- (U) Demonstrate software to consolidate multiple cartographic applications and optimize speed, accuracy, and reliability.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are Grumman Data System, Woodbury, NY; and Sterling Software Inc, Bellevue, NE.

(U) Related Activities:
(U) PE 0602702F, C3.
(U) PE 0603260F, Intelligence Advanced Development.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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,

Program Element: #0603726F Budget Activity: #2-Advanced Technology Development
PE Title: C3I Subsystem Integration

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 1991 Accomplishments:
- (U) Demonstrated a coherent optical system to reduce loss, increasing sensitivity, in remoted signal intelligence monitoring antennas.
- (U) Demonstrated high speed (100 megabits per second (MBPS)) Intrusion Detection Optical Communications for secure communication without encryption devices.
- (U) Developed a 0 to 500 MHz distortion-free fiber optic link for Electronic Security Command (ESC).

(U) FY 1992 Planned Program:
- (U) Demonstrate optical time/phase shifter networks to improve performance, efficiency, and antijam capability for phased array antennas for airborne phased array antenna surveillance system application.
- (U) Continue development of a distortion-free analog fiber optic link for antenna remoting at frequencies from 2 to 18 GHz.
- (U) Demonstrate a 0 to 500 MHz distortion-free fiber optic link at ESC to remote receive antenna systems.

(U) FY 1993 Planned Program:
- (U) Demonstrate a 1 giga-ops per second (GOPS) Optical Signal Processor for secure, jam resistant radar and communications.
- (U) Demonstrate an optical frequency synthesizer, a critical component for optical control to improve performance of phased array antennas.
- (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) Demonstrate a distortion-free analog fiber optic link at 2-18 GHz for ESC to remote receive antenna systems.

(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; Draper Labs, Cambridge, MA; and United Technologies, Hartford, CT.

Program Element: #0603726F Budget Activity: #2-Advanced Technology Development
PE Title: C3I Subsystem Integration

(U) Related Activities:
(U) PE 0602702F, C3.
(U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
(U) PE 0603789F, C3I Technology Development.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3192, Strategic/Tactical Optical Disk Systems (S/TODS): Present C3I systems lack low-cost, high density data storage capacity and performance required for advanced operations and near-real-time sensor inputs. This project develops S/TODS, a family of erasable data optical storage systems with the high capacity/speed input/output needed. S/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 S/TODS is for fighter aircraft for airborne access to mission-oriented data and the digital terrain system. The 14-inch S/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 Air Combat Command (ACC) deployable C2 centers.

(U) FY 1991 Accomplishments:
- (U) Completed detailed mechanical optical design of the 14-inch S/TODS system.
- (U) Evaluated, in the laboratory, the performance of the erasable storage media for the 14-inch S/TODS.
- (U) Conducted lifecycle testing on read/write/erase components.
- (U) Successfully operated, in space, the 5.25-inch S/TODS on-board NASA's Space Shuttle Discovery.

(U) FY 1992 Planned Program:
- (U) Complete detailed electronics 14-inch S/TODS system design, and fabrication/assembly of the 14-inch S/TODS subsystem modules.
- (U) Complete optical jukebox preliminary design for intelligence centers.
- (U) Initiate subsystem component integration and check-out of the 14-inch S/TODS subsystems.

(U) FY 1993 Planned Program:
- (U) Complete integration and flight demonstration of 14-inch S/TODS for airborne electronic intelligence (ELINT) recording.
- (U) Conduct 14-inch S/TODS user assessment.
- (U) Complete detail design and initiate assembly of the optical jukebox storing ten (10), double-sided, 14 inch disks in support of the Air Force digital image exploitation applications.

Program Element: #0603726F
PE Title: C3I Subsystem Integration
Budget Activity: #2-Advanced Technology Development

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB, NY. Major contractors are: Sundstrand Data Control, Remond, WA; and General Electric, Camden, NJ.

(U) Related Activities:
(U) PE 0602702F, C3.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 4171, Advanced EHF Communications Satellite Technology Demonstration: This project will develop and demonstrate light weight experimental EHF communications payload(s) and provide satellite/launch support. The payload, with standard "bolt-on" interface, will be hosted on the Advanced Standard Satellite Bus (ASSB). Increased performance, affordability, and interoperability will be given highest priority. This effort is part of the DARPA led, joint-Service Advanced Satellite Technologies and EHF Communications (ASTEC) demonstration. It contributes to the joint DoD Advanced Technology Demonstration for Global Surveillance and Communications Integrated Demonstration.

(U) FY 1991 Accomplishments:
- (U) None.

(U) FY 1992 Planned Program:
- (U) None.

(U) FY 1993 Planned Program:
- (U) Initiate design and development of advanced development components for light weight EHF Microwave Integrated Circuits (MICs) and Monolithic Microwave Integrated Circuits (MMIC) subsystems, high gain uplink nulling antennas, and high EIRP downlink transmit antennas.
- (U) Initiate planning for the integration of EHF payload components and subsystems with the ASSB.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB, NY. Contractual actions will be competively awarded.

(U) Related Activities:
(U) PE 0603226A, Experimental Evaluation of Major Innovative Technologies.
(U) PE 0603006A, C3.
(U) PE 0603726F, C3I Subsystems Integration.
(U) PE 0602203F, Aerospace Propulsion.
(U) PE 0603401F, Advanced Spacecraft Technology.
(U) PE 0602782A, C3 Technology.

Program Element: #0603726F Budget Activity: #2-Advanced Technology Development
PE Title: C3I Subsystem Integration

(U) This project has been coordinated and fully integrated with Army, Navy, Air Force, and DARPA plans to insure nonduplication and compatibility with the integrated demonstrations.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 4181, Advanced Surveillance Satellite Technology Demonstration: This project will develop and integrate advanced surveillance technologies and demonstrate an experimental satellite for application to global surveillance, adverse-weather precision strike targeting, and battle damage assessment. The satellite will also support test and evaluation of a selected set of bistatic radar operations using airborne receivers. Increased performance, affordability, and interoperability will be given highest priority. This effort is part of the Air Force led, joint-Service/DARPA Advanced Surveillance Satellite Technologies Demonstration. It contributes to the joint DoD Advanced Technology Demonstration for Global Surveillance and Communications Integrated Demonstration.

(U) FY 1991 Accomplishments:
- (U) None.

(U) FY 1992 Planned Program:
- (U) None.

(U) FY 1993 Planned Program:
- (U) As lead agent, initiate Joint Team/Steering Group activities including definition of detailed mission parameters and sensor mix.
- (U) Develop Advanced Surveillance Technology Program Management Plan.
- (U) Initiate design of demonstration sensors and satellite.

(U) Work Performed By: Project managed by Rome Laboratory, Griffiss AFB, NY. Contractual actions will be competively awarded.

(U) Related Activities:
(U) PE 0602702F, C3.
(U) PE 0602203F, Aerospace Propulsion.
(U) PE 0602102F, Materials.
(U) PE 0603428F, Space Subsystems Technology.
(U) This project has been coordinated and fully integrated with Army, Navy, Air Force, and DARPA plans to insure nonduplication and compatibility with the integrated demonstrations.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603728F Budget Activity: #2 - Advanced Technology Development
PE Title: Advanced Computing Technology

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2527 | Software Life Cycle Tools | | | | |
| | 2,960 | 3,380 | 3,900 | Cont | TBD |
| 2530 | Distributed Systems Reliability and Survivability | | | | |
| | 2,952 | 2,900 | 3,095 | Cont | TBD |
| 2532 | Knowledge-based Systems | | | | |
| | 3,148 | 3,577 | 4,143 | Cont | TBD |
| Total | 9,060 | 9,857 | 11,138 | 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). Special emphasis in FY 1993 will be on: automated code generation; distributed system survivability; adaptive planning during pre-, trans-, and post-attack; artificial intelligence (AI) system testbed capable of handling full scale tactical and C3I applications; and a demonstration of knowledge-based (AI) technology for optimal design and development of ADA software modules. The basic thrusts of the projects in this program element are to: (1) evaluate and transition new software engineering technology to improve the quality throughout software's life cycle in Air Force Mission Critical Software Systems; (2) improve survivability of land-, air-, and space-based dispersed command and control systems; and (3) 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.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 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 technology 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 Computing Technology

(U) FY 1991 Accomplishments:
- (U) Integrated 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) Integrated Software Project Management System (SPMS) into Software Life Cycle Support Environment (SLCSE), thereby, providing a powerful tool for system configuration control, baselining, and 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) The SLSCE will be enhanced with an improved user interface and data base management compatibility with various commercial systems, and augmented tool sets. These enhancements will be demonstrated at an Air Logistics Center.

(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 for reliable/survivable software.
- (U) Initiate Advanced Development Model for Automated Code Generation high level C3I specs as confirmation of technology for automated code generation in narrow applications.

(U) Work Performed By: Rome Laboratory, Griffiss AFB, NY, manages this project. Major 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2530, Distributed Systems Reliability and Survivability: This 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 Computing Technology

(U) FY 1991 Accomplishments:
- (U) Established dual cluster Single Integrated Operations Plan (SIOP) planning configuration to demonstrate ability to dynamically plan for relocatable targets.
- (U) Evaluated real-time distributed operating system in a distributed system environment for C3I and avionics survivability.

(U) FY 1992 Planned Program:
- (U) Demonstrate relocatable targets (RTs) SIOP planning for up to 1000 Strategic Relocatable Targets (SRTs) 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) Extend Strategic Adaptive Planning Experiment (SAPE) planning capability to multiple hypothesis generation - "what if" and multiple solution maintenance for option generation.
- (U) Expand SAPE multinode interoperations to include transfer of primary planning control to alternate nodes. Include multi-media control techniques to comm links.
- (U) Initiate development to demonstrate distributed C2 system functions in the presence of sporadic node/link failures.
- (U) Implement prototype reconfigurable distributed computing cluster to demonstrate survivability.

(U) Work Performed By: Rome Laboratory, Griffiss AFB, NY, manages this project. The major contractor is McDonnell Douglas Electronic Systems Company, Huntington, Beach CA.

(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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) 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 Computing Technology

(U) FY 1991 Accomplishments:
- (U) Demonstrated AI technology and evaluation framework for development of large-scale knowledge-based systems for command and control.
- (U) Demonstrated a knowledge-based "intelligent" assistant supporting all facets of software development to reduce time and cost of software development and support.

(U) FY 1992 Planned Program:
- (U) Demonstrate planning tools for rapidly evaluating alternatives for transportation planning.
- (U) Demonstrate prototyping environment at U.S. Transportation Command (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) FY 1993 Planned Program:
- (U) Demonstrate testbed capability to handle a full scale tactical C2I application based on AI technology.
- (U) Demonstrate knowledge-based software development methods for optimal design and development of ADA software modules.
- (U) Demonstrate knowledge-based configuration management capabilities for complex software systems development.
- (U) Demonstrate to USTRANSCOM the integration of planning and scheduling tools with intelligent data bases and simulation technology to support the generation, evaluation, and modification for reuse of crises action plans.

(U) Work Performed By: Rome Laboratory, Griffiss AFB, NY, manages this project. Primary contractions 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 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 | FY1991 Estimate | FY1992 Estimate | FY1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2597, Noncooperative Identification Subsystems | 1,991 | 23,729 | 1[illegible],100 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The U.S. Tactical Air Forces have a critical requirement to be able to positively identify enemy, friend, and neutral aircraft[ ] to enable the battlefield commander to manage and control the air battle, and to minimize fratricide. [ ] Also the national and international consequences of mistakenly shooting down a neutral aircraft are extremely serious. As a result, stringent operational requirements are imposed: [ ] [ ] This program element develops, demonstrates, [ ] 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) FY1991 Accomplishments:
   - (U) Have Centaur Phase I began. Have Centaur will demonstrate and [ ] in ground/flight tests.
   - (U) Have Lion Phase I began. Have Lion will demonstrate and [ ] in ground/flight tests.
   - (U) Initiated study to investigate feasibility of integrating the [ ]
   - (U) Initiated study to investigate incorporating [ ]
   - (U) Perform preliminary test runs at the Tactical Air Command and Control Simulation Facility (TACCSF).
   - (U) Began NCTI/ALR-56 feasibility study.

Program Element: #0603742F Budget Activity: 4 - Tactical Programs
PE Title: Combat Identification Technologies

2. (U) FY1992 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/ Centaur contract awards in 2QTRFY91 enable full execution at the start of FY92.
- (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 real-time[ ]
- (U) Collect[ ]
- (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.
- (U) Investigate/demonstrate NCTI technologies[ ]

4. (U) FY1993 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) [ ]demonstration is complete and FSED planning/documentation will be in-place.
- (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.
- (U) Investigate/demonstrate NCTI technologies[ ]

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

D. (U) Work Performed By: This work is managed by the Air Force Wright Laboratory, Wright-Patterson AFB, OH; and Rome Laboratory, Griffiss AFB, NY. Contractors include: Hughes Aircraft, Los Angeles, CA; Westinghouse, Baltimore, MD; Northrop, Los Angeles, CA; Veda, Inc., Dayton, OH.

Program Element: #0603742F Budget Activity: 4 - Tactical Programs
PE Title: Combat Identification Technologies

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Terminated Have Dance program to demonstrate [redacted] Decision was based on [redacted] Effort to focus on other NCTI technologies which may meet [redacted] range requirements will be investigated/demonstrated.
2. (U) SCHEDULE CHANGES: None beyond the cancellation of Have Dance.
3. (U) COST CHANGES: None -- Have Dance funds were redirected to investigate [redacted] NCTI techniques.

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, Advance 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 (JMNS) for Improved Identification Capability, 30 Sep 80.

G. (U) RELATED ACTIVITIES:
- (U) PE #0603203F, Advance Avionics for Aerospace Vehicles.
- (U) PE #0603789F, C3I Technology Development

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

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

J. (U) MILESTONE SCHEDULE:

| | | | |
|---|---|---|---|
| 1. | Have Centaur | PDR | 2QTRFY92 |
| | | CDR | 1QTRFY93 |
| | | Flight Test | 2QTRFY94 |
| 2. | Have Lion | PDR | 4QTRFY92 |
| | | CDR | 3QTRFY93 |
| | | Flight Test | 2QTRFY95 |
| 3. | NCTI/RWR Study | Start | 2QTRFY92 |
| 4. | TPS-75/ALQ-128 | Integration Study Complete | 4QTRFY93 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603789F Budget Activity: #2-Advanced Technology Development
PE Title: C3I Technology Development

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2333 Surveillance Radar Technology | 2,572 | 1,976 | 2,111 | Cont | TBD |
| 2335 Theater Battle Management C3 Technology | 3,117 | 3,085 | 3,266 | Cont | TBD |
| 3433 Laser Communications | 4,123 | 3,774 | 3,422 | Cont | TBD |
| 4072 Indirect Non-Cooperative Target Identification (NCTI) Adv Development | 0 | 800 | 1009 | Cont | TBD |
| Total | 9,812 | 9,635 | 9,808 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This advanced technology development program demonstrates/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. Better surveillance/communications technology must be developed to counteract an enemy's jamming of our surveillance capabilities, restore critical surveillance/communication capabilities, and to maintain our combative edge. Surveillance aircraft Conformal Array Radar Technology (CART) permits detection of low-observable and stealth targets negating affects of an enemy's efforts at jamming. Non-Cooperative Target Identification (NCTI) technology identifies hostile aircraft at long ranges under combat conditions in order to maximize the use of beyond visual range weapons as an edge in achieving air superiority. Technologies are developed for reliable, secure, jam resistant communications, a low probability of intercept (LPI) to transmit/receive crucial C3I information needed for real-time decision making. Battle management decision support technology assimilates this crucial C3I information into a form which facilitates and supports the military leader's combat decisions in response to the dynamics of the battlefield. Laser communications are being developed for satellite crosslinking techniques with secure anti-jam (A/J) and LPI capabilities to complement the ground- and air-based communications technology.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN 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, fusion algorithms, and conformal array technologies to restore low-observable/stealth surveillance capabilities in jammed sectors. It develops components and subsystems for actual surveillance systems, such as the Airborne Warning and Command and

Program Element: #0603789F Budget Activity: #2-Advanced Technology Development
PE Title: C3I Technology Development

Control System (AWACS) and Ground Tactical Air Control Systems (GTACS), that when integrated provides improved low cross section target detection in an ECM/clutter environment.

(U) FY 1991 Accomplishments:
- (U) Complete fabrication of the 1024 element CART antenna array, except for integration of 256 transmit/receive (T/R) modules and patch radiators.
- (U) Demonstrated manually inserted software calibration techniques and more efficient algorithm for increased mainbeam anti-jam and decreased computation time on C-Band radar.
- (U) Completed Multi-layer signal distribution boards. Began production of beamformers, patch radiators, and T/R modules.

(U) FY 1992 Planned Program:
- (U) Complete component development/subsystem integration. Evaluate partially populated conformal array sidelobe performance.
- (U) Evaluate/demonstrate a quarter filled 1024 element Conformal Array Radar Technology (CART) array.
- (U) Start installation/evaluation of automatic techniques for improved mainlobe antijam on C-Band radar.

(U) FY 1993 Planned Program:
- (U) Initiate plans for integrating CART radar into a static aircraft ground-based airframe testbed.
  (U) Complete laboratory installation of automatic mainbeam nulling techniques; evaluate application to a rotating antenna radar.
- (U) Begin procurement of additional CART modules for the airborne configuration to half fill the CART array to provide better beam shape control for the sidelobe/mainlobe ECCM tests and space time processing.

(U) Work Performed By: Rome Laboratory, Griffiss AFB, NY, manages this program. Major 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) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2335, Theater Battle Management C3 Technology: This technology program develops the technology for Air Combat Command contingency/joint operations C3I capability. Fundamental to the program are the concepts of force deployment, sustainment, and employment (global reach/global power). Dynamic, extremely hostile battlefield environments demand near instantaneous transmission and

Program Element: #0603789F Budget Activity: #2-Advanced Technology Development
PE Title: C3I Technology Development

processing of vast amounts of C3I information for real-time decision making. This project develops/integrates low probability of intercept, antijam (LPI/AJ) signal processing; modular, programmable, multi-level secure communications; secure and distributed networks; advanced displays and interfaces; and battle management decision support capabilities for survivable, distributed C3I facilities. These technologies, pursued as Joint Service initiatives, are integrated as a system into the Theater Battle Management (TBM) C3I test environment to apply a systems approach to evaluate and demonstrate technology.

(U) FY 1991 Accomplishments:
- (U) Integrated Media Resource Controller (MRC) and Advanced Multimedia Information Distribution System (AMIDS) into the TBM C3I test environment to demonstrate network survivability.
- (U) Initiated development of a Force Level Execution (FLEX) replanning capability (combat operations) to rapidly react to sudden situation changes, present options, and implement selected courses of action.
- (U) Continued development of SPEAKEASY technologies.

(U) FY 1992 Planned Program:
- (U) Demonstrate MRC/AMIDS network survivability and enhanced communications. Transition to system development.
- (U) Initiate development of enhanced communications networks with improved Multi-Level Secure (MLS) and survivable networking for continuation of communications in the face of jamming, destruction, system failure, etc.
- (U) Initiate rapid prototyping activity to provide FLEX functionality ensuring required decision assistance/automation for combat operations.
- (U) Begin Joint-Service demonstration of SPEAKEASY technologies.

(U) FY 1993 Planned Program:
- (U) Initiate SPEAKEASY interoperable multimode, multiband radio for planned Joint-Service advanced technology demonstration.
- (U) Complete MRC and transition into system development.
- (U) Continue Tactical Air Control Center (TACC) integrated operations-intelligence system design and implementation.
- (U) Complete development of FLEX and integrate into TBM C3I test environment for demonstration to user.

(U) Work Performed By: Rome Laboratory, Griffiss AFB, NY, manages this program. Major contractors are: Rome Research Corp, New Hartford, NY; Georgia Tech Research Institute, Atlanta, GA; and Hazeltine, Long Island, NY.

(U) Related Activities:
(U) PE 0602702F, C3.
(U) PE 0603617F, C3 Applications.
(U) PE 0603737D, Balanced Technology Initiative (BTI).
(U) PE 0603006A, C3 Technology.

Program Element: #0603789F Budget Activity: #2-Advanced Technology Development
PE Title: C3I Technology Development

(U) PE 0602232N, Command, Control, and Communications Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(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 1991 Accomplishments:
- (U) Built a high precision test environment for the LASERCOM satellite crosslink engineering model (EM).
- (U) Completed fabrication of the servomechanism, detector, control electronics, and software.
- (U) Completed the flight qualification of 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) FY 1993 Planned Program:
- (U) Complete space qualification and integrate EM subsystems.
- (U) Begin testing the acquisition, tracking, and communication systems of the integrated EM.
- (U) Provide design/technology baseline to future operational users; transition technology to government and industry.

(U) Worked Performed By: Phillips Laboratory, Kirtland AFB, NM, manages this program. Major contractors are: MIT-Lincoln Lab, Hanscom AFB, MA; Optical Corp of America, Garden Grove, CA; and Electrofusion, Fremont, CA.

(U) Related Activities:
(U) PE 0603250F, Lincoln Laboratory.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

Program Element: #0603789F Budget Activity: #2-Advanced Technology Development
PE Title: C3I Technology Development

(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 national, theater, and tactical sensors. This program complements fighter aircraft (direct) NCTI development in PE 63203F.

(U) FY 1991 Accomplishments:
- (U) None.

(U) FY 1992 Planned Program:
- (U) Define parameters/interfaces to incorporate advanced state-of-the-art fusion technology and real-time intelligence into the NCTI architecture.
- (U) Perform analysis to define parameters and interfaces to incorporate real-time intelligence into the NCTI architecture.
- (U) Initiate integration of advanced NCTI radar signal modulation techniques into the NCTI laboratory testbed in order to demonstrate the increased probability of positive ID to users.

(U) FY 1993 Planned Program:
- (U) Design critical experiments on integrated traditional and bistatic Electronic Support Measures System (ESM) to demonstrate NCTI advantages of this integration.
- (U) Integrate and test rudimentary bistatic ECM type algorithms to evaluate airframe ID.
- (U) Initiate coding of advanced multi-sensor fusion algorithm for installation and test on Rome Laboratory multiple sensors, utilizing targets of opportunity.

(U) Work Performed By: Rome Laboratory, Griffiss AFB, NY, manages this program. Contracts will be competitively awarded.

(U) Related Activities:
(U) PE 0602702F, C3.
(U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
(U) PE 0603742F, Combat Identification Technology.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604201F
PE Title: Aircraft Avionics Equipment Development
Budget Activity: #4-Tactical Programs

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2257 | Standard Avionics/Joint Services Review Committee (JSRC) Initiatives | | | | |
| | 2,544 | 2,260 | 2,500 | Cont | TBD |
| 2258 | Standard Inertial Navigation Unit (INU) | | | | |
| | 1,946 | 3,800 | 2,700 | 0 | 26,967 |
| 2297 | Embedded Computer Software Standardization (ECSS) | | | | |
| | 2,385 | 1,000 | 1,400 | Cont | TBD |
| 2519 | Airborne Radar Improvements | | | | |
| | 100 | 0 | 0 | Cont | TBD |
| 2560 | High Order Language Control Facility (LCF) | | | | |
| | 515 | 500 | 500 | Cont | TBD |
| 2658 | Avionics Architecture Implementation and Support (AAIS) | | | | |
| | 300 | 400 | 500 | Cont | TBD |
| 3264 | Standard Flight Data Recorder (SFDR) | | | | |
| | 1,811 | 3,000 | 3,100 | 0 | 37,495 |
| 4017 | Compass/Attitude & Heading Reference System (C/AHRS) | | | | |
| | 893 | 3,805 | 5,300 | 8,800 | 20,564 |
| Total | 10,494 | 14,765 | 16,000 | 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. The scope is both domestic and international. 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

Program Element: #0604201F Budget Activity: #4-Tactical Programs
PE Title: Aircraft Avionics Equipment Development

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.

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; supports international avionics initiatives.

(U) FY 1991 Accomplishments:
- (U) Continued front-end work to identify avionics standardization opportunities through Air Force, JSRC and DoD LSA processes.
- (U) Continued support of JSRC initiatives.
- (U) Evaluated Modular Avionics Systems Architecture (MASA)/ Line Replaceable Module (LRM) investigation and major retrofit study.
- (U) Continued development of Single Point Keying (SPK) standard(s).
- (U) Initiated development of power supply standards.
- (U) Maintained Air Force Avionics Roadmap and avionics database.
- (U) Continued Solid State Barometric Altimeter development.
- (U) Implemented/tested Avionics Life Cycle Cost Estimating System (ALCCES) (Merges Standardization Evaluation Program (STEP) with Avionics Acquisition Cost Estimating System (AACES)).
- (U) Initiated Common Weather Radar Program.
- (U) Initiated 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) Complete AACES development.
- (U) Continue Solid State Barometric Altimeter 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 #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: International collaborative avionics efforts are currently monitored via the Allied Standard Avionics Architecture Council (ASAAC).

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, F-117, MH-53J and Army OV-1, enhanced accuracy (0.4nm/hr) INU for the F-117A, and precision accuracy (SPA) (0.1nm/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).

Program Element: #0604201F
PE Title: Aircraft Avionics Equipment Development

Budget Activity: #4-Tactical Programs

(U) FY 1991 Accomplishments:
- (U) Integrated RLG on AC-130 gunship.
- (U) Initiated development of RLG INU depot SE.
- (U) Initiated INU Program Management Responsibility Transfer (PMRT) for both RLG and SPA INUs.

(U) FY 1992 Planned Program:
- (U) Develop maintenance & test sets and software for RLG INU SE.
- (U) Integrate RLG on JSTARS aircraft.
- (U) Continue work on PMRT residual tasks.
- (U) PMRT RLG and Precision INUs.
- (U) Develop Enhanced Accuracy Specification for Special Operations Forces (SOF).

(U) FY 1993 Planned Program:
- (U) Develop maintenance & test sets and software for SPA INU.
- (U) Continue work on precision accuracy INU SE development and PMRT residual tasks.
- (U) Complete developmental 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: 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).

Program Element: #0604201F Budget Activity: #4-Tactical Programs
PE Title: Aircraft Avionics Equipment Development

(U) FY 1991 Accomplishments:
- (U) Completed addition of symbolic debugger capability to Ada/1750A production quality compiler.
- (U) Initiated long term support contract for Ada/1750A compiler.
- (U) Initiated PMRT planning and negotiate PMRT date (FY 92).

(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) 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 2519, Airborne Radar Improvements: Develops generic radar improvements for current Air Force airborne fire control radar systems with emphasis on improved reliability and maintainability; coordinates radar development between Air Force laboratories and aircraft system program offices.

(U) FY 1991 Accomplishments:
- (U) Updated F-15, F-16, B-1B Radar Roadmaps.

Program Element: #0604201F Budget Activity: #4-Tactical Programs
PE Title: Aircraft Avionics Equipment Development

(U) FY 1992 Planned Program:
- (U) No activities planned.

(U) FY 1993 Planned Program:
- (U) No activities planned.

(U) Work Performed By: Program management is provided through Air Force Systems Command by Aeronautical Systems Division, Wright Patterson AFB, OH. Major contracts are with Hughes Aircraft Corp., Culver City, CA; Westinghouse Electric Corp., Baltimore, MD.

(U) Related Activities:
-(U) Program Element 0603203F, Advanced Avionics for Aircraft.
-(U) Program Element 0603253F, Advanced Avionics for Integration
-(U) Program Element 0602204F, Aerospace Avionics
-(U) There is no unecessary 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 2560, High Order Language Control Facility (LCF): Acts as a service organization to support USAF and DoD High Order Language (HOL) standardization efforts. HOL standardization assists in reducing computer software acquisition, operation, and maintenance costs by facilitating the development of reliable, maintainable, and reusable software. The HOLCF is responsible for centralized control of the JOVIAL J73 programming language, and DoD Ada programming language standardization.

(U) FY 1991 Accomplishments:
- (U) Completed development of JOVIAL/1750 Computer Based Training (CBT) Course.
- (U) Continued technical support to other AF organizations.
- (U) Validated two JOVIAL J73 compilers.
- (U) Developed and distributed JOVIAL training materials and support tools to organizations and support contractors.

(U) FY 1992 Planned Program:
- (U) Continue validation of JOVIAL and Ada compilers (ongoing process as developmental enhancements occur with software)
- (U) Continue technical support to other AF organizations.
- (U) Continue development and distribution of JOVIAL training materials and support tools.

Program Element: #0604201F Budget Activity: #4-Tactical Programs
PE Title: Aircraft Avionics Equipment Development

- (U) Develop Ada CBT for MIL-STD-1750A applications.
- (U) Develop Ada compiler usability test set.

(U) FY 1993 Planned Program:
- (U) Continue validation of JOVIAL and Ada compilers.
- (U) Continue technical support to other AF organizations.
- (U) Complete Ada CBT for MIL-STD-1750A applications.
- (U) Complete Ada compiler usability test set.

(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.

6. (U) Project 2658, Avionics Architecture Implementation and Support (AAIS): Supports 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, and investigates/develops new standards.

(U) FY 1991 Accomplishments:
- (U) Performed MIL-STD-1553B testing for 5 subsystems.
- (U) Performed MIL-STD-1750 testing for 16 computers.
- (U) Continued MIL-HDBK-1760 development.
- (U) Continued 32 bit computer architecture standard development.
- (U) Developed 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.

Program Element: #0604201F Budget Activity: #4-Tactical Programs
PE Title: Aircraft Avionics Equipment Development

- (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.

(U) FY 1993 Planned Program:
- (U) Perform MIL-STD-1553B testing for 6 subsystems.
- (U) Perform MIL-STD-1750 testing for 12 computers.
- (U) Continue support of 32 bit computer architecture standard.
- (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: NATO STANAG version of MIL-STD-1760 is in development. Supports information exhcange with Air Standardization Coordinating Committee.

7. (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 1991 Accomplishments:
- (U) Flight tested trial integration units.
- (U) Began T/OA-37 SFDR development.
- (U) Began SFDR depot support equipment development.
- (U) Began DTIU development.
- (U) Completed Acquisition Strategy Plan for follow-on production contract.
- (U) Began F-16 Low Rate Initial Production (LRIP) deliveries.
- (U) Delivered C-17, C-130, C-141, and T-38 LRIP flight test units.

Program Element: #0604201F Budget Activity: #4-Tactical Programs
PE Title: Aircraft Avionics Equipment Development

(U) FY 1992 Planned Program:
- (U) Deliver flight test LRIP units for F-111, F-15, B-52, C-135.
- (U) Begin C-130 and C-141 SFDR LRIP deliveries.
- (U) Continue SFDR depot support equipment development.
- (U) FCA/PCA/HQA of core system.
- (U) Complete DTIU development.
- (U) Award follow-on production contract/Milestone III approval.

(U) FY 1993 Planned Program:
- (U) Complete development of SFDR depot support equipment.
- (U) Complete LRIP deliveries.
- (U) Make first full rate production delivery.
- (U) Depot IOC.

(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: There are other Army and Navy contractors for Flight Data Recorder Systems.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.

8. (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 1991 Accomplishments:
- (U) Released RFP and completed Source Selection.
- (U) Awarded C/AHRS Engineering and Manufacturing Development (EMD) contract with two small production options.
- (U) Initiated EMD, particularly the study/definition phase.

(U) FY 1992 Planned Program:
- (U) Complete study/aircraft definition phase.
- (U) Evaluate initial design for prime equipment and support equipment.

Program Element: #0604201F Budget Activity: #4-Tactical Programs
PE Title: Aircraft Avionics Equipment Development

- (U) Complete System Requirement Review (SRR).
- (U) Complete Preliminary Design Review (PDR).
- (U) Fabricate and evaluate full scale nonfunctional form/fit models.

(U) FY 1993 Planned Program:
- (U) Complete Critical Design Review (CDR).
- (U) Design, develop, and fabricate units for Qualification/Durability and flight testing.

(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.*

## FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2459, Target Payload Systems | 4,504 | 4,731 | 4,700 | Cont | TBD |
| 3165, Full Scale Aerial Target Systems | 6,500 | 18,900 | 17,200 | Cont | TBD |
| Total | 11,004 | 23,631 | 21,900 | 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 infrared (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.

- (U) FY 1991 Accomplishments:
  - -- (U) Completed MEGS development, began IOT&E.
  - -- (U) Continued ECM threat assessment.
  - -- (U) Began IR countermeasures development for subscale targets.

Program Element: #0604211F Budget Activity: 6 - Defense-Wide Mission Support
PE Title: Advanced Aerial Targets Development

- (U) FY 1992 Planned Program:
  - -- (U) Develop ground control system interface for subscale targets.
  - -- (U) Participate in tri-service development program for non-cooperative vector scoring.
  - -- (U) Improve survivability of the QF-106 target.
  - -- (U) Initiate study of radar cross section enhancements for improved target realism.

- (U) FY 1993 Planned Program:
  - -- (U) Continue to participate in tri-service 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 Commanders 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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| QF-4 | 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. An Air Force led tri-service program for 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 1991 Accomplishments:
   - (U) QF-4 development transitioned to tri-service program
   - (U) Contract awarded 4 February 1992

3. (U) FY 1992 Planned Program:
   - (U) Complete QF-4 development through Preliminary Design Review.
   - (U) Begin contractor flight test.
   - (U) Cost estimate: Final, July 1990.
     -- (U) Anticipated contract types:
        --- FSD, fixed-price incentive
        --- Production, firm fixed price with EPA clause

4. (U) FY 1993 Planned Program:
   - (U) Complete QF-4 development through contractor flight test
   - (U) Develop common tri-service flight termination system

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

D. (U) Work Performed By: Honeywell, Inc., Sperry Defense Systems Division, Albuquerque, NM

Program Element: #0604211F
PE Title: Advanced Aerial Targets Development

Project Number: 3165
Budget Activity: 6 - Defense-Wide Mission Support

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

1. (U) TECHNICAL CHANGES: Tri-service requirements incorporated.

2. (U) SCHEDULE CHANGES: Program initiation delayed during transition to a tri-service program.

3. (U) COST CHANGES: Reduced FY91 budget due to Congressional cuts.

F. (U) PROGRAM DOCUMENTATION:
- (U) TAF SON 408-82, 24 May 84 (validated 16 Jan 85).
- (U) TAF SORD 408-82-I-C, Revision 1, 4 Sep 91

G. (U) RELATED ACTIVITIES:
- (U) PE 0305116F Aerial Target Procurement.
- (U) Interservice coordination through Joint Logistics Commanders, Joint Commanders 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| WSC:M106QF (QF-106) | | | | | |
| Cost: | 23,504 | 1,400 | 32,877 (1) | N/A | 97,242 |
| Qty: | 48 | 0 | 40 | N/A | 184 |
| WSC: M34ABQ (BQM-34) | | | | | |
| Cost: | | 22,900 | 27,339 | 28,006 | |
| Qty(2): | 53 | 42 | 52 (3) | Cont | TBD |
| WSC: M04AQF (QF-4) | | | | | |
| Cost: | | | | | |
| Qty: | 0 | 0 | 0 | Cont | TBD |

NOTES: 1. Recent policy change requires program to fund refurbishment of GFE airframe. These costs were previously charged to the O&M appropriation.
2. Quantities based on latest contract price and include GFE.
3. BQM-34 funding and quantities were reduced to offest increased QF-106 costs (Note 1)

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

J. (U) MILESTONE SCHEDULE:

| | |
|---|---|
| 1. Contract Award | 2nd Qtr FY 1992 |
| 2. Critical Design Review | 2nd Qtr FY 1993 |
| 3. DT&E/IOT&E Begins | 2nd Qtr FY 1994 |
| 4. First Production Delivery / IOC | 2nd Qtr FY 1996 |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 1926 Aircraft Windshield Development | 2,890 | 4,054 | 4,000 | Cont | TBD |
| Total | 2,890 | 4,054 | 4,000 | 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 FY 1993:

1. (U) Project 1926 Aircraft Windshield Development: Demonstrate emerging technologies to provide windshield systems with mission capatible hazard tolerance, optical quality and a 50% reduction in life cycle costs.

(U) FY 1991 Accomplishments:
- (U) Provided solutions to fix badly abraded windshields which increased the mission sortie rate during Operation Desert Storm.
- (U) Developed solar shields which decreased cockpit temperatures by 100 degrees F which helped increase the life and reliability of avionics equipment.
- (U) Continued flight evaluation of B-1B extended life windshields which have already demonstrated a 100% increase in service life.
- (U) Developed an improved bird impact resistant T-38 windshield system.
- (U) Developed a portable haze/distortion measurement device.
- (U) Updated the birdstrike risk assessment for the F-15 and F-16.
- (U) Conducted baseline birdstrike testing for the F-15 and F-16.

(U) FY 1992 Planned Program:
- (U) Transition B-1B extended life windshield to operational use.
- (U) Conduct flight evaluation of improved bird impact resistant T-38 windshield system.
- (U) Complete design review of F-16 advanced canopy and begin prototype test and evaluation.
- (U) Complete design review of F-15 prototype alternative transparency system and begin test and evaluation.

Program Element: #0604212F Budget Activity: #4 - Tactical Programs
PE Title: Aircraft Equipment Development

- (U) Initiate development of removal-for-cause criteria for service-aged transparencies.

(U) FY 1993 Planned Program:
- (U) Perform OT&E on F-16 advanced canopy.
- (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) Begin OT&E of B-1B windshields for the 1995-2000 mission needs.
- (U) Apply durability validation technologies for competitive reprocurement of the F-111, B-1B, F-15 and F-16 transparancies.
- (U) Apply transparency service life tracking methodologies.
- (U) Initiate development of theory of electrostatic discharge phenomenon.

(U) Work Performed By: The contractor is the University of Dayton Research Institute, Dayton, OH. The program is managed at Aeronautical Systems Division, Wright-Patterson AFB, 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 0207129F, F-111 Squadrons
- (U) Program Element 0207133F, F-16 Squadrons
- (U) Program Element 0207134F, F-15E Squadrons
- (U) Program Element 0804741F, Undergraduate Pilot Training
- (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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2634, Engine Model Derivative Program | | | | | |
| | 510 | 3,984 | 1,000 | Cont | TBD |
| Total | 510 | 3,984 | 1,000 | 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 such as Multirole Fighter (MRF) and A-X aircraft. 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 1993:

1. (U) No Project Number, Engine Model Derivative Program:

(U) FY 1991 Accomplishments:

- (U) Accomplished Increased Thrust Derivative Engine (ITDE) (formerly Increased Capability Engine (ICE)) conceptual design studies to provide additional thrust growth, advanced controls and accessories, and low observables for the Multi-Role Fighter (MRF) and AX aircraft by integrating Advanced Tactical Fighter Engine technology into a derivative Increased Performance Engine which will provide essential capability for MRF/AX applications.
- (U) Began preliminary design efforts for an integrated propulsion module for the AGM-130E per MAJCOM request.
- (U) Examined engine candidates and system needs.
- (U) Continued to analyze current engines for future derivative potential and update the roadmap to meet MAJCOM requirements.

Program Element: #0604218F
PE Title: Engine Model Derivative Program (EMDP)

Budget Activity: #4 - Tactical Programs

(U) FY 1992 Planned Program:
- (U) Begin Increased Thrust Derivative Engine design effort.
- (U) Begin qualification effort of the 1000 pound thrust class engine for unmanned air vehicles.
- (U) Complete preliminary design efforts for an integrated propulsion module for the AGM-130E.
- (U) Continue examination of engine candidates and system needs.
- (U) Continue to analyze current engines for future derivative potential and revise the roadmap to meet MAJCOM requirements.

(U) FY 1993 Planned Program:
- (U) Complete Increased Thrust Derivative Engine design effort.
- (U) Complete qualification effort of the 1000 pound thrust class engine for unmanned air vehicles.
- (U) Initiate effort to support contractor demonstrations of thrust vectoring nozzles, low observables technology, advanced controls and accessories, and thrust growth for Increased Thrust Derivative Engine.
- (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) 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, P8300); Allison, Indianapolis IN (Model 150, 250 propfan, T56); Teledyne CAE, Toledo OH (235 propfan, Model 382-12, 318-1, 384-4A); and Garrett Corporation, Phoenix AZ (ETJ1081, F124/F125,F109).

(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 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 5708 Nuclear Weapons Support | 2,359 | 5,784 | 5,626 | 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 OL-NS/EN.

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 (OL-NS) civilian nuclear weapon specialists. These specialists are the core of Air Force nuclear weapon systems expertise. They provide technical guidance to the Department of Energy (DOE) and direction to the North Atlantic Treaty Organization for fulfillment of Air Force (AF) respon- sibilities related to development and support of nuclear weapon systems. [NOTE: OL-NS 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), 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), 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. Provides technical advisors to Congressionally-chartered nuclear Fail- safe and Risk Reduction (FARR) Advisory Committee studies of all AF systems under review.

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

(U) Project 5708, Nuclear Weapons Support:
Funds OL-NS civilians to technically support all new and fielded USAF Nuclear Systems.

(U) FY 1991 Accomplishments:
- (U) Completed AFSC reorganization of WL/NTS to OL-NS
- (U) Assumed LPO responsibilities for all USAF nuclear warheads except W87 (Deputy LPO)
- (U) Completed study of Air Force system safety issues raised by the Congressionally-chartered Drell Panel and developed recommendations for addressing those issues
- (U) Studied stockpile adjustments required by DOE facility shortfalls, e.g., pit reuse
- (U) Performed safety studies/reviews on B-1B, F-15E, PA-200, and B-52G
- (U) W89 - continued production engineering until canceled
- (U) W87 - continued integration for Rail Garrison until canceled
- (U) W61 - continued Phase 3, Development Engineering until canceled
- (U) W91 - continued Phase 3, Development Engineering until canceled
- (U) Performed safety studies on older weapon systems W69, B57, B61-0,2, W56, W62, and W78
- (U) Continued Phase 6 (stockpile activities) for B53, W56, B57, B61, W62, W69, W78, W80, B83, and W87

Program Element: #0604222F Budget Activity: #6 Defense Wide Mission Support
PE Title: Nuclear Weapons Support

- (U) Initiated Phase 1 Nuclear weapon concept studies of a high-power RF weapon and an ICBM (W78) replacement warhead
- (U) Completed retirement of BGM-109G Gryphon (INF Treaty)
- (U) Completed technical report on Digital Transmission of Unique Signals
- (U) Completed C-17 nuclear cargo tiedown analysis
- (U) Started the AF Seek Eagle-directed Integrated Aircraft/Weapons Certification System under contract with LANL
- (U) Completed nuclear weapon shipping container and C-141 tiedown testing and analysis for transport of Army weapons from Europe

(U) FY1992 Planned Program:
- (U) Continue same level of effort
- (U) Increase conversion of military to civilian positions
- (U) Continue implementation of Drell Panel recommendations
- (U) Perform approximately eight major safety studies/reviews
- (U) Perform Technology Improvement Studies
- (U) Complete High-Power RF Weapon and ICBM (W78) replacement warhead Phase 1 studies; initiate follow-on Phase 2 studies as required
- (U) Study alternatives for meeting SAC requirement for SRAM-type weapon
- (U) Initiate approximately 4 Phase 1 studies and 5 Pre-Phase 1 studies
- (U) Support Air Force nuclear weapon Phase 6 (stockpile activities) and retirements as required
- (U) Continue Stockpile Improvement Program and FARR study support
- (U) Conduct surety technology transfer activities
- (U) Continue surety analyses/integration activities of modifications for Minuteman and Peacekeeper in Minuteman silos
- (U) Initiate nuclear safe escape data development

(U) FY1993 Planned Program:
- (U) Continue FY 1992 level of effort
- (U) Complete conversion of military to civilian positions
- (U) Continue any ongoing Pre-Phase 1, Phase 1, or Phase 2 studies, initiate follow-on studies as required
- (U) Continue to perform nuclear weapon safety studies
- (U) Continue support for Air Force nuclear weapon stockpile activities and retirements as required
- (U) Continue nuclear safe escape effort

(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 (OL-NS) - 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 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 0101113F (B-52 Offensive Avionics System)
- (U) PE 0101126F (B-1B); PE 0604226F (B-1B)

Program Element: #0604222F
PE Title: Nuclear Weapons Support

Budget Activity: #6 Defense Wide Mission Support

- (U) PE 0101127 (B-2)
- (U) PE 0207130F/0207134F (F-15E Squadrons)
- (U) PE 0207590F Aircraft Stores Certification (Seek Eagle/nuclear)

(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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604223F
PE Title: Alternate Fighter Engine (AFE)
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2815, Alternate Fighter Engine | 5,013 | -0- | -0- | -0- | 541,054 |
| Total | 5,013 | -0- | -0- | -0- | 541,054 |

B. (U) BRIEF DESCRIPTION OF ELEMENT: The AFE Program funds the Engineering and Manufacturing Development (EMD) of the F100-PW-229 and F110-GE-129 Increased Performance Engines (IPEs). These two engines are derivatives of the F100-PW-220 and the F110-GE-100 Alternate Fighter Engines. IPEs will give F-15s and F-16s the capability to counter the evolving 1990s threat. The AFE Program also completes development and integration of the Configured Engine Bay (CEB) for F-15E aircraft, providing the capability to install either of the IPEs.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN FY 1993:

1. (U) No Project Number, Alternate Fighter Engine:

(U) FY 1991 Accomplishments:
- (U) Completed final residual engine task qualification testing with the exception of a few minor parts which are being completed as contract considerations.
- (U) Completed F-15E/F-16/IPE weapon system qualification testing.
- (U) Completed F-15E CEB integration development testing.
- (U) Completed Operational Capability Release (OCR) testing.

(U) FY 1992 Planned Program: Not Applicable, IPE development program complete in FY91.

(U) FY 1993 Planned Program: Not Applicable, IPE development program complete in FY91.

(U) Work Performed By: The Propulsion System Program Office (SPO) and the F-15 SPO, Aeronautical Systems Division, Wright-Patterson AFB OH, manage the engine program and the F-15/IPE Qualification Program, respectively. Contractors are: General Electric, Evendale OH, (F110-GE-129); Pratt and Whitney, West Palm Beach FL, (F100-PW-229); McDonnell Douglas Corporation, St. Louis MO (F-15/IPE Qualification); General Dynamics Corporation, Ft Worth TX.

Program Element: #0604223F
PE Title: Alternate Fighter Engine (AFE)

Budget Activity: #4 - Tactical Programs

(U) Related Activities:
- (U) Program Element #0604218F (Engine Model Derivative Program) conducted preliminary development of F100 and F110 IPEs.
- (U) PE #0604268F (Aircraft Engine Component Improvement Program) complements AFE by addressing engine flight safety problems, service-revealed deficiencies and the achievement of durability goals.
- (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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604226F Budget Activity: #3 - Strategic Programs
PE Title: B-1B

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 4142 RWR | 0 | 0 | 31,100 | 82,500 | 113,600 |
| 4143 IAM & Conventional | 0 | 0 | 59,286 | TBD | TBD |
| 2731 Anti-ice & TAG | 0 | 1,357 | 305 | 200 | Cont |
| Total | 0 | 1,357 | 90,691 | TBD | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: Funds included in this program element provide for completion of the radar warning receiver comparison study, for the start of the engineering manufacturing development (EMD) effort to integrate a stand alone radar warning receiver into the B-1B, for the initiation of a conventional weapons improvement program that includes an inertially aided munition (IAM) capability, MIL STD 1760 advanced stores interface, and a computer complex upgrade. Funds are included to begin the integration of GPS into the B-1B, to replace the TACAN, and to enhance the navigational accuracy to aid in conventional weapons delivery. Additionally, funds are provided to conduct exploratory tests for avionics upgrades needed to conduct conventional operations. Funds are also included to cover the costs associated with the threat assessment group (TAG) studies and analyses required to assess future B-1B requirements.

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

1. (U) Project: 2731, Anti-ice and Threat Assessment Group (TAG): Funds in this PE provide for an anti-ice system comparison study, to be completed using FY92 funds, and support associated with TAG threat assessments and modeling to begin in FY92.

(U) FY 1991 Accomplishments:

- (U) No RDT&E funds were planned for FY 1991.

(U) FY 1992 Planned Program:

- (U) Anti-ice: Funds in this project provide for studies and experiments to aid in the selection of a design approach for an anti-ice system for the B-1B.

- (U) TAG: Funding will be used to evaluate the threat changes that specifically affect the B-1B. This information will be used to ensure programmed countermeasures address current threat descriptions and capabilities and to ensure timely changes are incorporated in the reprogrammable defensive avionics system.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604226F Budget Activity: #3 - Strategic Programs
PE Title: B-1B

(U) FY 1993 Planned Program:

- (U) TAG: Funding will support continued threat assessments and updates.

(U) Work Performed By: The contractors to perform the described anti-ice activities have not been identified. Work for the TAG effort will be performed by government organizations including the B-1B System Program Office, Tinker AFB, OK, and the Directorate of Bombers and Tankers, Aircraft System Program Office, Wright-Patterson AFB, OH.

(U) Related Activities: Not Applicable.

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

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604226F
PE Title: B-1B
Project Number: 4142
Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 4142 RWR | 0 | 0 | 31,100 | 82,500 | 113,600 |
| Total | 0 | -0- | 31,100 | 82,500 | 113,600 |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The B-1B is a long range combat aircraft capable of multiple roles in support of both nuclear and conventional operations. This project develops a stand alone radar warning receiver for threat situational awareness needed by B-1B aircrews. This capability was added to the B-1B baseline in 1988 as a part of the B-1B ECM Recovery Plan. The RWR will augment the capability in the current defensive avionics system, the ALQ-161A. Funds included in this program element start the full scale development (FSD) of the stand alone radar warning receiver for the B-1B. Engineering Manufacturing Development (EMD) begins after completion of a side-by-side comparison test of the ALR-56M and the ALR-62I. FY92 funds for this comparison test were deleted from the EW Development PE, 0604270F. The FY92 National Defense Authorization Act directs these tests in FY92 using available funds. Sources to be identified.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Not Applicable. Congressional language in the FY91 Department of Defense Appropriations Act prohibited the use of any funds for research, development, test, evaluation, installation, or procurement of a RWR for the B-1B until the Congressionally directed side-by-side comparison test of the ALR-56M and ALR-62I is completed. No funds were made available for this comparison.

2. (U) FY 1992 Planned Program:
   - (U) Begin side-by-side comparison tests and evaluations of the ALR-56M and ALR-62I as a stand alone RWR for B-1B application. Prepare for a full scale development program beginning in FY93.

3. (U) FY 1993 Planned Program:
   - (U) Complete the side-by-side comparison tests and evaluations of the ALR-56M and ALR-62I. Award the FSD contract to integrate a selected RWR into the B-1B bomber.

4. (U) Program to Completion:
   - (U) Complete software and hardware integration on the B-1B and complete flight test. Development program complete in FY96.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604226F
PE Title: B-1B
Project Number: 4142
Budget Activity: #3 - Strategic Programs

D. (U) Work Performed By: The B-1B System Program Director located at Oklahoma City Air Logistics Center, Tinker AFB, OK, will manage the radar warning receiver project. Rockwell International, North American Operations, Los Angeles, CA, is the airframe contractor supporting the comparison test. Other contractors for the comparison test of the ALR-56M and ALR-62I are Loral System Manufacturing Company, Yonkers NY; and Dalmo Victor, Belmont, CA. Contractors for EMD have not been selected. Government organizations responsible for various development efforts to be used in this program include: the B-1B System Program Office, Tinker AFB, OK; The Directorate of Bombers and Tankers, Aircraft Systems Program Office, Wright-Patterson AFB, OH; Rome Laboratories, Griffis AFB, NY; Air Force Electronic Evaluation Simulator, Dallas, TX; Warner Robins Air Logistics Center, Robins AFB, GA; and the Air Force Flight Test Center, Edwards AFB, CA.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None

2. (U) SCHEDULE CHANGES: None

3. (U) COST CHANGES: $9.8M in FY92 for the side-by-side comparison testing of the ALR-56M and the ALR-62I in the EW Development PE, 0604270F, was zeroed by Congress.

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-1 Program (Baseline Nov 81)
(U) B-1B TEMP, 7 Nov 88
(U) B-IB PMD, (5 Dec 91)

G. (U) RELATED ACTIVITIES

(U) Design and development of the ALQ-161A is complete
(U) ALQ-161A Core Defensive Avionics System testing was completed on 28 Feb 91
(U) PE 0604270F, EW Development

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604226F
PE Title: B-1B
Project Number: 4142
Budget Activity: #3 - Strategic Programs

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. | (U) Start Comparison Study | 1992 |
| 2. | (U) Start RWR Integration FSD | 1993 |
| 3. | (U) Complete RWR Integration FSD | 1996 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604226F
PE Title: B-1B
Project Number: 4143
Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 4143 IAM & Conventional | 0 | 0 | 59,286 | TBD | TBD |
| Total | 0 | 0 | 59,286 | TBD | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Air Force's long-range bombers must be capable of precision attacks against heavily-defended targets deep in enemy airspace during both nuclear and conventional operations. However, current B-1B conventional combat capability is limited to the delivery of only light-weight, non-precision 500-pound gravity bombs. This program will significantly increase the B-1B's capability by adding avionics computer, Global Positioning System (GPS) navigation systems, and radio and weapon bay modifications necessary to employ the 2,000-pound, near-precision Inertially Aided Munition (IAM) with additional growth capability, including MIL STD 1760, for other precision "smart" weapons. In addition, funds are included to study and conduct exploratory tests on potential upgrades to the B-1B's existing avionics suite, as well as to prepare specifications and requests for proposals for a system upgrade in FY 1994. This upgrade will address the performance and maintainability shortfalls left after the cancellation of the ALQ-161A Core program and the threats encountered in the conventional bomber role. Funding for this effort must be provided to ensure the Air Force maintains a globally applicable state-of-the-art conventional capability.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) None.

2. (U) FY 1992 Planned Program:
   - (U) None

3. (U) FY 1993 Planned Program:
   - (U) Contract award for B-1B avionics computer hardware and software development.
   - (U) Contract award for B-1B/GPS integration (hardware and software) development.
   - (U) Purchase test aircraft support equipment.
   - (U) Conduct studies and exploratory tests on ways to upgrade the currently-fielded B-1B defensive system.
   - (U) Prepare for contract award in FY 1994 for an avionics upgrade.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604226F
PE Title: B-1B
Project Number: 4143
Budget Activity: #3 - Strategic Programs

4. (U) Program to Completion:
- (U) Complete avionics computer and GPS integration development and laboratory tests.
- (U) Develop nuclear launcher modifications for conventional weapons capability.
- (U) Conduct wind tunnel test and analysis for B-1B IAM separation.
- (U) Conduct developmental flight test of all modifications.
- (U) Conduct sufficient separation tests to certify IAMs on the B-1B.
- (U) Award development contract to upgrade the B-1B defensive suite.
- (U) Complete laboratory and flight test of the upgraded avionics system.

D. (U) Work Performed By: Contractors have not yet been determined. This program is currently planning to compete the majority of the developmental work. The in-house development organizations responsible for the program are the B-1B System Program Office, Tinker AFB, OK and Aeronautical Systems Division, Aircraft Systems Program Office, Directorate of Bombers and Tankers, Wright-Patterson AFB, OH.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY: Not applicable.

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-1 Program (Baseline Nov 81)
(U) B-1B TEMP, 7 Nov 88
(U) B-IB PMD, (5 Dec 91)

G. (U) RELATED ACTIVITIES

(U) Program Element #0305164F, (GPS)
(U) Program Element #0604618F/N, (JDAM)
(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.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604226F
PE Title: B-1B
Project Number: 4143
Budget Activity: #3 - Strategic Programs

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. | (U) Start Development Phase | Aug 1993 |
| 2. | (U) Complete Avionics Upgrade Development Studies | Oct 1993 |
| 3. | (U) Complete Development Phase | Nov 1996 |
| 4. | (U) Production Deliveries | Late 1998 |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2325 Simulator Development Activities | 1,379 | 3,500 | 3,550 | Cont | TBD |
| 2769 Simulator Update Development/Simulator Requirements Definition | 3,729 | 3,399 | 6,800 | Cont | TBD |
| 2851 Standard DOD Simulator Data Base/Common Transformation Program | 3,532 | 3,500 | 3,600 | Cont | TBD |
| 2901 B-1B Weapon Systems Trainer | 4,423 | 5,354 | 3,700 | 0 | 131,600 |
| 2968 Modular [illegible]mulator Design | 887 | 2,400 | 1,800 | 0 | 24,855 |
| 3135 Advanced Training System (ATS) | 7,431 | 7,077 | 4,100 | 7,300 | 39,719 |
| 3282 C-17 Aircrew Training System | 7,077 | 3,000 | 1,100 | 500 | 75,800 |
| 3772 C-141 Aircrew Training System | 9,697 | 3,911 | 1,000 | 500 | 28,939 |
| 3775 Manpower, Personnel, and Training | 288 | 700 | 500 | 0 | TBD |
| 4022 Simulator for Electronic Combat Training (SECT) | 50 | 7,974 | 10,674 | 11,000 | 29,698 |
| 4033 Joint Primary Aircraft Training System (JPATS) | 0 | 1,337 | 400 | 37,463 | 39,200 |
| TOTAL | 38,493 | 42,152 | 37,224 | Cont | TBD |

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. New program starts include the Simulator for Electronic Combat Training in FY91, and the Joint Primary Aircraft Training System (JPATS) in FY92.

Program Element: #0604227F
PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide Mission Support

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. Efforts currently planned or underway include an operational evaluation of four visual simulation display technologies designed to determine which low-altitude tasks can be taught with each technology. Another effort is the Simulator Data Integrity Program (SDIP), which developed a military process standard for the Aircrew Training Equipment source data flow from the weapon system contractor to the training system contractor. Project 2325 is a continuing project that transitions laboratory developments into acquisition requirements.

(U) FY 1991 Accomplishments:
- (U) Determined flight simulator motion requirements and developed the algorithms for the simulator drive mechanism.
- (U) Completed development of motion/force cueing module.
- (U) Developed Military Process Standard which will be used on future simulator acquisition.
- (U) Completed Baseline Analysis for updating the Instruction System Development (ISD) process.

(U) FY 1992 Planned Program:
- (U) Develop handbook to aid in the implementation of the developed SDIP standard.
- (U) Begin second generation low cost, lightweight helmet coupled image generation and projection device.
- (U) Begin design of Universal Threat Simulator System.
- (U) Complete the evaluation of visual system display technologies and publish the results.
- (U) Modify Air Force guidance to reflect changes in the ISD process.

(U) FY 1993 Planned Program:
- (U) Complete work on Standard DoD universal threat simulator.
- (U) Complete visual system effectiveness study.
- (U) Complete the modification of Air Force guidance on implementing the ISD process.

Program Element: #0604227F
PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide Mission Support

- (U) Develop handbooks to assist the application of the standard on maintenance training devices and courseware.

(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.

(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. Initiatives are identified and funded through this project to modify and upgrade existing training systems. Contained within Project 2769 are updates to the KC-135 ATS, C-130 ATS, and AFSPACECOM training systems. The $3.0M increase in FY93 is required to convert KC-135 training from organic to a contractor Aircrew Training System. This effort was identified in DoD DMRD initiative #947. When in place, the initiative will provide $1.5M in savings per year in O&M expenses. Project 2769 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 1991 Accomplishments:
- (U) Developed and evaluated prototypes for the visual low altitude training system.
- (U) Replaced existing C-130 training device computers with computers capable of supporting future modifications to the C-130 ATS.

(U) FY 1992 Planned Program:
- (U) KC-135 ATS source selection and contract award.
- (U) Complete visual low altitude training system analysis.
- (U) Regin training requirements definition for new MAC C-130H aircraft.

Program Element: #0604227F
PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide Mission Support

- (U) Conduct Front End Analysis (FEA) on mission tasks regarding AFSPACECOM training systems, and how and where each task will best be trained.

(U) FY 1993 Planned Program:
- (U) Continue KC-135 ATS development.
- (U) Complete AFSPACECOM training systems definition/analysis.
- (U) Begin USAF Academy Computer Based Training system definition.
- (U) Increase over FY92 funding is needed to convert KC-135 training from organic to a contractor Aircrew Training System.

(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.

3. (U) Project 2851 - Standard DOD Simulator Data Base/Common Transformation Program: Develops a standard DOD digital data base library and distribution function, exchange standards, and a data base enhancement and generation capability. This minimizes simulator database development redundancy within and among the services, and will maximize database utility and interoperability.

(U) FY 1991 Accomplishments:
- (U) Completed basic system development and preliminary acceptance testing.
- (U) Completed preliminary design of rapid database generation and image processing capability.
- (U) Developed and coordinated with the services and industry, a data base Standard Interchange Format (SIF) MIL-STD and contracted systems implementation.

(U) FY 1992 Planned Program:
- (U) Implement SIF capability and demonstrate data base inter-operability between the C-17 and C-141 Aircrew Training Systems.

Program Element: #0604227F
PE Title: Training Systems Development

Budget Activity: #6 - Defense-Wide Mission Support

- (U) Begin Full Scale Development/Operational Testing (FSD/OT) effort for prototype database standardization system.

(U) FY 1993 Planned Program:
- (U) Conclude the FSD/OT and pre-production support efforts.
- (U) Begin effort for final upgrade of system software and hardware suite, installation, test, training, and data.
- (U) Modify Defense Mapping Agency Aerospace Center facility to accept system.

(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: None. However, there is currently strong interest within the German MoD to implement a similar capability and compatible with Project 2851 for exchange of data bases. Potential exists for cooperative development involving possibly the rapid data base and imagery processing capabilities.

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 1991 Accomplishments:
- (U) Delivered final two WSTs and two Mission Trainers.
- (U) Began work on WST Interim Version 2.7 upgrade.
- (U) Accomplished Mission Generation System Training, Overwing Fairing Fire Detection Phase I, and the Miniature Receive Terminal WST enhancement development efforts.

(U) FY 1992 Planned Program:
- (U) Deliver Overwing Fairing Modification on all trainers.

Program Element: #0604227F
PE Title: Training Systems Development

Budget Activity: #6-Defense - Wide Mission Support

- (U) Begin development of WST Aircraft Flight Software (AFS) Block 4.5 Merge 3 update.

(U) FY 1993 Planned Program:
- (U) Deliver WST AFS Block 4.5 Merge 3 update.
- (U) Incorporate defense stations updates.
- (U) Complete system developments.

(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 1991 Accomplishments:
- (U) Completed draft standard for modular simulators, demonstrated concept, and validated on F-16 simulator.

(U) FY 1992 Planned Program:
- (U) Complete concept demonstration and validation.
- (U) Develop propulsion module and radar modules.
- (U) Analyze advanced avionics compatibility for modular simulation.

(U) FY 1993 Planned Program:
- (U) Demonstrate networking capability.
- (U) Publish standards for future acquisitions.
- (U) Incorporate DoD Standard Data Base into visual modules.
- (U) Complete program.

(U) Work Performed By: The Training Systems SPO, ASD Wright-Patterson AFB OH. Prime contractor; Boeing Military Airplane Co., Huntsville AL.

Program 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 incresed 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 in- efficient 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 1991 Accomplishments:
- (U) Completed Interface Control Documents (ICDs) for external system interfaces.
- (U) Completed Software Specification Review, Hardware and Software Preliminary Design Reviews.
- (U) Distributed new Computer Resources Life Cycle Management Plan.

(U) FY 1992 Planned Program:
- (U) Remaining Software Preliminary Design Reviews, Software Critical Design Reviews.
- (U) Final Software Critical Design Review.
- (U) Begin development of courseware and evaluation modules.

(U) FY 1993 Planned Program:
- (U) Completion of Development Test and Evaluation.
- (U) Begin development of schedule/management modules.
- (U) Begin Operational Test and Evaluation.

(U) Work Performed By: Advanced Training System SPO, HSD, Brooks AFB TX. Contractor is IBM, Federal Systems Division, Manassas VA.

Program 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.

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 1991 Accomplishments:
- (U) Completed Critical Design Review (CDR).
- (U) Initiated fabrication of training devices.
- (U) Continued courseware and software development.
- (U) Initiated development of Training System Support Center (TSSC)

(U) FY 1992 Planned Program:
- (U) Conduct site training readiness review at Charleston AFB.
- (U) Complete basic courseware development.
- (U) Train initial squadron crews at Charleston AFB.
- (U) Continue fabrication of training devices for Altus AFB.
- (U) Begin modifying developmental unit to maintain concurrency with aircraft.

(U) FY 1993 Planned Program:
- (U) Develop and incorporate all outstanding (aircraft driven) training change requirements.
- (U) Complete advanced (Airdrop) courseware.
- (U) Deliver Altus AFB Training Device.

(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 or the Department of Defense.

Program Element: #0604227F
PE Title: Training Systems Development

Budget Activity: #6-Defense - Wide Mission Support

(U) Other Appropriation Funds:
Aircraft Procurement (BP 1000):

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 22,447 | 0 | 10,780 | 66,208 | 125,123 |

(U) International Cooperative Agreements: Not applicable.

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 1991 Accomplishments:
- (U) Upgraded prototype training equipment for Altus AFB. System now has an advanced visual system, 6 Degree Of Freedom (DOF) motion capability, and modified simulator flight data software.
- (U) Continued ATS courseware development.
- (U) Completed prototype Training Management System (TMS).

(U) FY 1992 Planned Program:
- (U) Upgrade second simulator system at Altus, duplicating capabilities of first system.
- (U) Complete formal school development.
- (U) Deliver computer based training.
- (U) Begin incremental Course Readiness Reviews (CRRs) to validate courseware development.

(U) FY 1993 Planned Program:
- (U) Begin training validation.
- (U) Finish courseware development.
- (U) Complete CRRs to validate courseware.

Program Element: #0604227F
PE Title: Training Systems Development

Budget Activity: #6-Defense - Wide Mission Support

(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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 2,196 | 8,831 | 9,523 | 16,525 | 37,075 |

(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 1991 Accomplishments:
- (U) Developed System Integration Specialist Course.
- (U) Conducted front-end analysis/requirement identification.
- (U) Developed MPT integrated data base; updated 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.

Program Element: #0604227F
PE Title: Training Systems Development

Budget Activity: #6-Defense - Wide Mission Support

(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.

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 portion of the system.

(U) FY 1991 Accomplishments: Not applicable.

(U) FY 1992 Planned Program:
- (U) New start
- (U) Perform JPATS/SUPT Integration Study to identify areas of commonality/conflict with the other SUPT systems.
- (U) Conduct front end requirements analysis study.
- (U) Establish System Management Office.

(U) FY 1993 Planned Program:
- (U) Build and release draft 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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604227F
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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Simulator for Electronic Combat Training (SECT) | | | | | |
| | 50 | 7,974 | 10,674 | 11,000 | 29,698 |

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 1991 Accomplishments:
   - (U) Completed training requirements analysis.
   - (U) Released Request For Proposal (RFP).

2. (U) FY 1992 Planned Program:
   - (U) Award contract (tentatively scheduled for 30 Apr 92).
   - (U) Complete Preliminary Design Review.

3. (U) FY 1993 Planned Program:
   - (U) Complete system design and begin hardware/software development.
   - (U) Complete Critical Design Review.
   - (U) Begin in-plant test of system.
   - (U) Increase in FY92 funding level based upon 30 April 92 contract award, resulting in expanded program effort in FY93

4. (U) Program to Completion:
   - (U) Deliver system.
   - (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 yet been selected.

Program Element: #0604227F
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: Six month slip in contract award due to unacceptable initial proposal responses.
3. (U) COST CHANGES: Decrease in funding levels reflects the contract award delay, and subsequent slip in program milestones.

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 | Apr/May 1992 |
| 2. (U) Critical Design Review | Oct 1992 |
| 3. (U) Test and Evaluation | Mar 1994 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604231F
PE Title: C-17 Program
Project: #xxxl
Budget Activity: #4-Tactical Programs
Project Title: C-17

POPULAR NAME: C-17

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

| BUDGET ($000) | FY 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| Major Contract | R&D 682.100 | R&D 280,800 | R&D 151,000 | R&D 70,700 |
| Support Contract | 1,733 | 1,488 | 1,458 | 1,739 |
| In-House Support | 5,467 | 6,312 | 5,142 | 3,841 |
| GFE/Other | 42,926 | 84,227 | 52,437 | 20,049 |
| Total | 732,226 | 372,527 | 210,000 | 96,200 |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | To Complete |
| Program Milestones | N/A | N/A | N/A | IIIB TBD |
| Engineering Milestones | N/A | N/A | N/A | N/A |
| T&E Milestones | 1st Flight Sep 91 | N/A | N/A | Complete DT&E/IOT&E 1 Qtr FY 94 |
| Contract Milestones | Lot III Contract Award Jul 91 | Lot IV 4 A/C Aug 92 | Lot V 8 A/C Mar 93 | 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 strategic deployment of combat forces to support national objectives and for timely theater 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 strategic and theater environments. Therefore, it will not only increase our overall airlift capability, but will be able to replace the capability lost from retiring aging 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 1991 Accomplishments:
- (U) Completed O&I level support equipment critical design reviews
- (U) Completed procurement of GFE mission flight test spares
- (U) Completed aircraft engineering design and drawing releases
- (U) Completed assembly of test aircraft (T-1), 21 Dec 90
- (U) Issued the Lot IV RFP for 6 aircraft, 16 Apr 91
- (U) Awarded the definitized Lot III production contract for 4 aircraft, 30 Jul 91
- (U) Completed first production aircraft (P-1) airloads calibration testing, Sep 91
- (U) Conducted T-1 first flight, 15 Sep 91
- (U) Continued avionics/software integration
- (U) Completed development of detailed test planning
- (U) Procured GFE flight test support equipment

2. (U) FY 1992 Planned Program:
- (U) Continue developmental testing
- (U) Complete assembly of durability and static articles
- (U) Begin durability and static testing
- (U) Complete O-level technical order validation
- (U) Deliver maintenance/aircrew trainers to Charleston AFB, SC
- (U) Conduct first flight/delivery of production/test aircraft (P-1, P-2, and P-3)
- (U) Begin P-1, P-2, and P-3 aircraft flight testing
- (U) Exercise 4th increment of ICS investment spares
- (U) Continue support equipment design and drawing release
- (U) Continue avionics/software integration
- (U) Deliver initial squadron support equipment to Charleston AFB
- (U) Award the Lot V advance buy contract for 8 aircraft
- (U) Issue the Lot V RFP
- (U) Award the definitized Lot IV production contract for 4 aircraft
- (U) Continue avionics/software integration

Program Element: #0604231F
PE Title: C-17 Program
Project: xxxl
Budget Activity: #4-Tactical Programs

3. (U) FY 1993 Planned Program:
   - (U) Complete static article ultimate strength testing
   - (U) Complete one life of durability testing
   - (U) Begin dedicated IOT&E
   - (U) Deliver initial squadron support equipment to Charleston AFB
   - (U) Complete I-level T.O. validation
   - (U) Begin P-4 aircraft flight testing
   - (U) Complete P-5 FCA/PCA
   - (U) Begin initial operations at Charleston AFB, SC

4. (U) Program to Completion:
   - (U) Complete 2nd life durability test
   - (U) Complete combined DT&E/IOT&E
   - (U) Complete Support Equipment (SE) FCA/PCA
   - (U) Complete Milestone IIIB
   - (U) Exercise 5th increment of ICS investment spares
   - (U) Complete D-level T.O. validation

D. (U) WORK PERFORMED BY: Douglas Aircraft Company, Long Beach, California.

E. (U) COMPARISON WITH FY 1992 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 maximum payload/range threshold is 160,000lbs/2400nm.
2. (U) SCHEDULE CHANGES: IOC date (Sep 94) reflects delivery of P-16 under the 120 aircraft delivery scheduled in Aug 94. P-5 through P-16 are the 12 aircraft required to declare IOC.
3. (U) COST CHANGES: RDT&E: (-$4,000,000 in FY91) This decrease is the result of an Unfunded Requirement sourced with C-17 FY 91 3600 funds. (+$200,000,000 in FY91) Increase to cover payments for contractor work performed in FY91 that was rephased as a result of the program restructure - reduces FY92 requirement. (-$200,000,000 in FY92) Amendment to FY92 President's Budget request as an adjustment reflecting the FY91 reprogramming. (-$1,000,000 in FY92) Congressional action. PROCUREMENT: (+$86,000,000 in FY90) This increase is due to Omnibus Reprogramming to fund over target protection for Lot III. (-$200,000,000 in FY91) Decrease for Omnibus Reprogramming in FY91. (+$200,000,000 in FY92) Amendment to FY92 President's Budget request as an adjustment resulting from the FY91 reprogramming. (-$560,000,000 in FY92) Congressional reductions to FY92 and FY93 aircraft procurement.

Program Element: #0604231F
PE Title: C-17 Program
Project: xxxl
Budget Activity: #4-Tactical Programs

F. (U) PROGRAM DOCUMENTATION:
- (U) SON (MENS) Nov 80
- (U) SORD, 23 May 91
- (U) DCP Jun 88
- (U) ADM 6 Nov 89
- (U) Acquisition Program Baseline (APB), 20 Feb 92.
- (U) TEMP - Approved 4 Oct 88, revision 5 in coordination.

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 ($ in Thousands):

- (U) PROCUREMENT (PE #0401130F):

| | FY 1991 | FY 1992 | FY 1993 | To | Total |
|---|---|---|---|---|---|
| | Actual | Estimate | Estimate | Complete | Program |
| Funds | 270.2 | 1811.6 | 2898.6 | 21118.7 | 29773.4 |
| Quantity | 0 | 4 | 8 | 98 | 120 |

- (U) MILITARY CONSTRUCTION (PE #0401130F):

| | FY 1991 | FY 1992 | FY 1993 | To | Total |
|---|---|---|---|---|---|
| | Actual | Estimate | Estimate | Complete | Program |
| Funds | 29.5 | 76.1 | 31.6 | 318.9 | 464.4 |

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

| Event | Date | Results |
|---|---|---|
| Fuel System Simulator Qualification Tests | Dec 90-Apr 91 | Completed/Redesigns underway - retest |
| Propulsion System Qualification Tests | Aug 90-May 91 | Satisfactory |
| Landing Gear Drop Tests | Jul 90-Feb 91 | Satisfactory |
| T-1 Avionics System Level Tests | Sep 90-Sep 91 | Satisfactory |
| P-1 Airload Calibration Test | Jun 91-Aug 91 | Satisfactory |
| T-1 Flight Testing | 15 Sep 91- | On-going |

T&E ACTIVITY (TO COMPLETION)

| Event | Planned Date | Remarks |
|---|---|---|
| Initiate DT&E | Jun 91 | Current Start Sep 91 |
| Initiate Dedicated IOT&E | Jan 93 | Current Start May 93 |
| Complete DT&E/IOT&E | Aug 93 | Current End Date Nov 93 |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 643853 T-1A Tanker-Transport Training System (TTTS) | 2.358 | 3.133 | 2.500 | 5.000 | 17.836 |
| 644102 Joint Primary Aircraft Training System (JPATS) | 0 | 1.100 | 2.200 | 35.090 | 38.390 |
| Total (T-1A/JPATS) | 2.358 | 4.233 | 4.700 | 40.090 | 56.226 |

B. (U) BRIEF DESCRIPTION OF ELEMENT: The T-1A (Tanker-Transport) Training System is required to implement Specialized Undergraduate Pilot Training (SUPT) in Air Training Command. 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 Ground Based Training System (GBTS) portion of the T-1A Training System will include compatible simulators, courseware, ground training devices, syllabus, and student management. The Tanker-Transport 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 Services' fleets of primary trainer aircraft (T-37/T-34 respectively) and associated ground based training systems. USAF will serve as the lead or Executive Service.

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

1. (U) 43853, T-1A (Tanker-Transport) Training System:
See PE description above.

(U) FY 1991 Accomplishments:
- (U) Complete missionization of aircraft and simulators
- (U) Begin QT&E/OT&E of aircraft

(U) FY 1992 Planned Program:
- (U) Take delivery of first aircraft
- (U) Mission support
- (U) Start Instructor Pilot (IP) training

Program Element: #0604233F Budget Activity: #4 - Tactical Programs
PE Title: Specialized Undergraduate Pilot Training (SUPT)

(U) FY 1993 Planned Program:
- (U) Start student training
- (U) Deliver courseware for Pilot Instructor Training (PIT)
- (U) Activate Randolph AFB PIT and Training System Support Center (TSSC)
- (U) Hazardous Material identification and modification
- (U) Begin production of Vance AFB aircraft and simulators
- (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 (Aurora).

(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 and GBTS Procurement (BA 03):

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 155.805 | 156.142 | 158.592 | 326.358 | 950.797 |
| (QTY) | (28) | (34) | (36) | (67) | (180) |

(U) International Cooperative Agreements: Not Applicable.

2. (U) 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. They have antiquated, increasingly unsupportable and non-representative avionics and underpowered and fuel 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 1991 Accomplishments:
- N/A

(U) FY 1992 Planned Program:
- (U) Accomplish necessary studies to ensure JPATS components are adequately and smoothly integrated into SUPT
- (U) Conduct 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
- (U) Release Request for Proposal

(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):
- (U) Aircraft Procurement (BA 03)

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 0 | 0 | 3.699.700 | 3.699.700 |
| (QTY) | (0) | (0) | (0) | (417) | (417) |

(U) International Cooperative Agreements: TBD

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3308 Variable Stability In-Flight Simulator Aircraft (VISTA) | | | | | |
| | 11,184 | 2,080 | 2,200 | 0 | 49,197 |
| Total | 11,184 | 2,080 | 2,200* | 0 | 49,197 |

* This PE is scheduled for completion in FY 1993 instead of FY 1992 because of technical difficulties and a contractor overhead increase which led to overall cost growth and subsequent program schedule extension.

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; 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 asset for flight research.

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

(U) Project 3308, Variable Stability In-Flight Simulator Test Aircraft: 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. 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. The NT-33 needs to be replaced because its performance is not representative of future aircraft (it's the oldest aircraft in the Air Force still actively flying). 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.

(U) FY 1991 Accomplishments:
- (U) Completed aircraft modification tasks including major subsystem installation, variable stability system integration, and wing and horizontal stabilizer mate.

Program Element: #0604237F Budget Activity: #4 - Tactical Programs
PE Title: Variable Stability In-Flight Simulator Aircraft (VISTA)

- (U) Completed software validation and verification.
- (U) Conducted hydraulic system pressure tests, power on electrical checks and environmental control system checks.

(U) FY 1992 Planned Program:
- (U) Complete remaining aircraft modification tasks including cockpit equipment installation and instrumentation system wiring.
- (U) Complete all ground testing to ensure design safety requirements have been met.
- (U) Conduct flight readiness review.
- (U) Initiate developmental flight testing.

(U) FY 1993 Planned Program:
- (U) Complete developmental flight testing to verify operational performance.
- (U) Conduct physical and functional configuration audit.
- (U) Complete program and transition VISTA to flight research.

(U) Work Performed By: This project is managed by the Flight Dynamics Directorate of the Wright Laboratory, Wright-Patterson AFB, OH. The prime contractor is General Dynamics, Fort Worth Division, Fort Worth, Texas.

(U) Related Activities:
(U) PE #0602201F, Aerospace Flight Dynamics.
(U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604239F
PE Title: ADVANCED TACTICAL FIGHTER (ATF) EMD
Project: Not Applicable
Budget Activity: #4-Tactical Programs

Project Title: ATF EMD

POPULAR NAME: F-22

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

| BUDGET | FY 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| ($000) | | | | |
| Major Contract | 196,389 | 1,563,589 | 2,148,062 | 11,068,876 (14,976,916) |
| Support Contract | | 1,000 | 1,000 | 18,000 (20,000) |
| In-House Support | | 12,652 | 12,657 | 87,181 (112,490) |
| GFE/ Other | | 43,805 | 62,549 | 546,739 (653,093) |
| Total | 196,389 | 1,621,046 | 2,224,268 | 11,720,796 (15,762,499) |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | To Complete |
| Program Milestones | Milestone II DAB Jun 91 | | | |
| Engineering Milestones | | Air Vehicle Design Rev | Air Vehicle PDR | First Flight |
| T&E Milestones | | | First EMD Engine to Test | DT&E/OT&E IOT&E |
| Contract Milestones | EMD CA Aug 91 | | | |

( ) Indicate program total

Program Element: # 0604239F
PE Title: ADVANCED TACTICAL FIGHTER (ATF) EMD
Project: Not Applicable
Budget Activity: #4-Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The F-22 Program will develop the next-generation air superiority fighter for introduction in the early 2000's to counter the emerging worldwide threat. The F-22 is designed to penetrate enemy airspace and achieve a first-look, first-kill capability against multiple targets. The F-22 Engineering & Manufacturing Development (EMD) effort will be based on the Weapon System Specification formulated from data developed during the Dem/Val (Prototype) phase. The EMD program will consist of design, fabrication, and development testing of 11 EMD flight test vehicles (9 single and 2 dual seat); updating of Avionics Flying Laboratory (AFL) and using it to develop and integrate the EMD avionics suite; and design and development of a support and training systems. The F-22 program from the outset has placed balanced emphasis on performance, survivability, reliability/maintainability and affordability. The F-22 is characterized by a low observable highly maneuverable airframe, new engine capable of supersonic cruise, and advanced integrated avionics.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Completed Demonstration/Validation flight schedule.
   - (U) Conducted EMD source selection and awarded contracts to winning weapon system contractor team and winning engine contractor.
   - (U) Initiated design of EMD aircraft and support elements; continued design of EMD engines.

2. (U) FY 1992 Planned Program:
   - (U) Complete Air Vehicle Requirements/Design Review Update.
   - (U) Complete Prototype Air Vehicles (PAV) flight test.
   - (U) Complete Critical Design Review (CDR) for EMD engine.
   - (U) Determine baseline for Common Avionics between RAH-66 and F-22.
   - (U) Use PAVs and prototype engines to provide loads data for final design iteration.
   - (U) Complete Support System Requirements/Design Review Update.
   - (U) Initiate fabrication of EMD ground test engines.

3. (U) FY 1993 Planned Program:
   - (U) Complete Air Vehicle PDR.
   - (U) First EMD engine to test (FETT).
   - (U) Avionics system modeling/simulation results available.
   - (U) Complete Training Systems Requirement/Design Review Update.
   - (U) Initiate fabrication of EMD flight test engines and aircraft.
   - (U) Continue subsystem design, development and test activity

4. (U) Program to Completion:
   - (U) Program review to authorize long lead for pre-production verification (PPV) aircraft.
   - (U) Eleven EMD 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 F-22 EMD program will be managed by the Aeronautical Systems Division (ASD), Wright-Patterson AFB, OH. Contracts have been awarded to Lockheed Aeronautical Systems Corporation in Marietta, Georgia and Pratt & Whitney Corporation in West Palm Beach, Florida.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

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

Program Element: # 0604239F
PE Title: ADVANCED TACTICAL FIGHTER (ATF) EMD
Project: Not Applicable
Budget Activity: #4-Tactical Programs

3. (U) COST CHANGES:
S2,691,708 increase since last President's Budget (PB). A Most Probable Cost (MPC) estimate was developed during the source selection for the winning air vehicle and engine contractors (the Lockheed team and Pratt & Whitney) which refined the F-22 EMD funding requirements. This estimate reflects the winning contractor's specific configuration. Previous estimates have been based on a generic F-22 configuration. Inherent within the MPC are updated technical inputs (weight, low observables properties, complexities, etc.) which were the result of the extensive source selection. Additionally, the 1 August 1991 Acquisition Decision Memorandum (ADM) signed by the Under Secretary of Defense for Acquisition, USD(A), directed the program to budget to a higher cost EMD program to reflect greater allowance for technical risk.

F. (U) PROGRAM DOCUMENTATION:
- (U) TAF SON 304-83, Statement of Operational Need for Advanced Tactical Fighter, 9 Nov 84
- (U) TAF SORD 304-83-I/IIA, Advanced Tactical Fighter, 22 Mar 91
- (U) PMD 7036(14)/0603230F/0604239F, 19 Mar 91
- (U) ATF TEMP, 23 Mar 90
- (U) F-22 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 EMD.
- (U) PE 0604250F, Preliminary EMD 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).
- (U) PE 0207219F, F-22 Procurement planned for FY 1996 with advanced buy in FY 1995.
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS (S 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 | FY95 | |
| (U) | Start combined DT&E/IOT&E Flight Testing | FY95-FY00 | |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604240F Project: #N/A
PE Title: B-2 (ATB) Budget Activity: #3-Strategic Programs
Project Title: Advanced Technology Bomber

POPULAR NAME: B-2

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

| BUDGET ($000) | FY 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| Major Contract | 1,491,590 | 1,172,847 | 977,000 | 2,035,500 |
| Support Contract | 133,540 | 247,300 | 168,500 | 168,100 |
| In-House Support | 9,660 | 7,600 | 6,600 | 19,400 |
| GFE/ Other | 80,900 | 118,300 | 115,900 | 227,200 |
| Total | 1,715,690 | 1,546,047 | 1,261,384 | 2,450,090 |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | (To Complete |
| Program Milestones | First flight AV3 Jun 91 | First flight AV4&5 | 1st flight AV6. 1st SAC Delivery | RAA - 96 FOC - 98 |
| Engineering Milestones | | | | |
| T&E Milestones | Start L/O Testing 1st Flt AV-2 | | | |
| Contract Milestones | | | | |

Program Element: #0604240F Project: #NA
PE Title: B-2 (ATB) 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; however, emphasis is being placed on conventional missions and capabilities. The range of the B-2 allows it to strike targets anywhere in the world with minimum refueling support and reduces our dependence on over-seas basing. The aircraft is equipped with twin weapon bays and has the capability of carrying over 48,000 pounds of conventional munitions. It can carry the full complement of conventional gravity weapons and will have a precision capability with the TSSAM weapon system. The B-2's design exploits recent breakthroughs in low observable technology to achieve reduced vehicle signatures which allows penetration of all current and postulated threats. Deployment of the B-2 will preserve the vitally needed flexibility for worldwide non-nuclear force projection.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY1991 Accomplishments:
   - (U) Continued B-2 system development with emphasis on flight test activities of the FSD aircraft
   - (U) Continued flight testing of the navigation and radar systems on C-135 test bed
   - (U) Continued testing of the D&DT airframe and testing of static airframe

2. (U) FY1992 Planned Program:
   - (U) Continue system development with flight test
   - (U) Continue system flight testing of navigation and radar systems on C-135
   - (U) Testing of the D&DT airframe and testing of static airframe

3. (U) FY1993 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
   - (U) System development flight test .

4. (U) Program to Completion:
   - (U) Continue until Full Scale Development and IOT&E/FOT&E testing is complete
   - (U) This is a continuing program

Program Element: #0604240 Project: #NA
PE Title: B-2 (ATB) Budget Activity: #3-Strategic Programs

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.

E. (U) COMPARISON WITH FY1992 DESCRIPTION SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: There have been no major technical changes.

2. (U) SCHEDULE CHANGES: There have been no significant schedule changes in the B-2 R&D test program. The Required Assets Available (RAA) remains in late FY96; however, the Full Operational Capability has been pulled back to FY98 because the overall B-2 buy was reduced to 21 (20 Operational 1 Test).

3. (U) COST CHANGES: Last year the program cost was reported to be $65.1B. The FY1993 President's Budget reduced the B-2 buy from 75 to 21 which reduced the cost of the program. The FY94-97 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 August 1991
- (U) PMD 2020 (9), dated 12 March 1991

Program Element: #0604240F Project: #NA
PE Title: B-2 (ATB) Budget Activity: #3-Strategic Programs

G. (U) RELATED ACTIVITIES:

- (U) The aircrew training devices and mission planning systems for the B-2 are funded in the B-2 baseline

  -- (U) The programs are managed by the B-2 System Program Office

  -- (U) The training devices include Weapon System Trainers, Mission Trainers, and a System Support Center (SSC)

  -- (U) The Mission Planning systems include the Aircraft/Cruise Missile Force Application System and the Strategic Mission Data Preparation System (SMDPS)

    --- (U) Cost are included in total program cost

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

H. (U) OTHER APPROPRIATION FUNDS (TY $ M)

- (U) Procurement - (BA01/05)

| FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|
| 2,348.4 | 2,798.2 | 2,686.6 | 2,762.6 | 19,752.6* |

- (U) MILCON

| FY 1991 Actual | FY1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|
| 101.1 | 38.0 | 80.2 | 314.0 | 879.9 |

* Excludes Mods (FY94-98; $423.0)

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 | DATA | RESULT |
|---|---|---|
| (U) First Flight | 17 Jul 89 | Successful |
| (U) Initial Block 1 Testing | Summer 90 | Successful, basic flying qualities demonstrated |
| (U) AV-2 First Flight | 19 Oct 90 | Successful |
| (U) Completion of FY91 SMM Milestones | | Jan 91 Preliminary RCS Baseline signature assessment successfully accomplished |
| (U) AV-3 First Flight | 18 Jun 91 | Successful |
| (U) Completion of FY92 SMM Milestones | | Dec 91 Additional assessment of RCS baseline data; Updated estimated air vehicle flight characteristics; AV-3 accomplished radar and navigation functional/integration; Demonstrated ground test of weapon compatibility. |

T&E ACTIVITY (TO COMPLETION)

| EVENT | DATE | REMARKS |
|---|---|---|
| (U) FY93 - FY95 SMM Milestones | | Test areas to include further testing in mission performance (Weapons, Nav/Radar), Low Observables, Air Vehicle performance (aero performance, flying qualities, loads, and air refueling), and Integrated Logistics Support (reliability, maintainability, tech data) |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604242F Budget Activity: # 4 - Tactical Programs
PE Title: ADVANCED INTERDICTION AIRCRAFT (AX) STUDY

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

| Project Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| AX | 2,766 | 1,999 | 2,000 | 0 | *4,000 |

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Advanced Tactical Aircraft program was terminated with cancellation of the A-12 contract, leaving the USAF with an ongoing requirement for a future deep interdiction aircraft to replace the F-111, F-117 and the F-15E. The Navy is conducting the Concept Exploration and Definition (CE&D) Phase for an Advanced Strike Aircraft (AX) which could meet Air Force requirements for an advanced interdiction aircraft. The USAF intends to study mission effectiveness and costs of AX compared with several alternatives in order to address possible future Air Force participation in the Navy AX Program.

*Total funding includes only FY92/93 study cost.

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

(U) FY 1991 Accomplishments:
- (U) Closed out ATA program following termination of A-12 contract.
- (U) Closed out earlier Risk Reduction studies from ATA program.
- (U) Began identifying tentative USAF requirements for AX.

(U) FY 1992 Planned Program: (executed with remaining FY 1991 funds and reprogrammed FY 1992 funds identified in Letter of Notification to Authorizations and Appropriations Committees, dated 16 and 18 Dec '91, respectively):
- (U) Participate in Navy funded AX Concept Exploration & Definition (CE&D) trade studies.
- (U) Participate in preparation of solicitation documentation for Demonstation & Validation (D/V) phase.
- (U) Conduct studies to identify critical USAF weapon systems characteristics for incorporation in Operational Requirements Document (ORD).
- (U) Begin USAF analysis of AX operational effectiveness in relation to cost.

(U) FY 1993 Planned Program:
- (U) Navy release of D/V solicitation documentation to industry.
- (U) Complete USAF operational effectiveness & cost analysis.
- (U) Participate in ORD preparation.
- (U) Navy D/V source selection (Air Force participates).
- (U) Milestone I Defense Acquisition Board.
- (U) Navy award of D/V contract.
- (U) Participate in risk reduction activities, initial System Requirements and Joint Integrated Avionics Review Group.

(U) Work Performed By: IN-HOUSE: Aeronautical Systems Division, Dayton, OH; Air Force Studies & Analysis Agency, Wash D.C. AF STUDY CONTRACTOR: Veda Inc., Dayton, OH. NAVY FUNDED CE&D CONTRACTORS: Rockwell International Corp, Los Angeles, CA; McDonnell Douglas Corp, St. Louis, MO; Lockheed Corp, Marietta, GA; Grumman Aerospace Corp, Bethpage, NY; and General Dynamics, Ft. Worth, TX.

Program Element: #0604242 Budget Activity: # 4 - Tactical Programs
PE Title: ADVANCED INTERDICTION AIRCRAFT (AX) STUDY

(U) Related Activities:
- (U) Program Element # 0604233N, (ATA/AX).
- (U) Program Element # 0604239F, (F-22).
- (U) Program Element # 0604223A, (LHX).
- (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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3816 Pilot Candidate Selection Method (PCSM) | 1,599 | 635 | 100 | Cont | 5,848 |
| 3817 Base Training System (BTS) | 1,500 | 656 | 154 | Cont | TBD |
| 3818 Maintenance Skills Tutors (MST) | 551 | 1,218 | 3,046 | Cont | TBD |
| Total | 3,650 | 2,509 | 3,300 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides engineering development of manpower, personnel, and training (MPT) technologies to improve effectiveness of AF training development/delivery, performance assessment, personnel acquisition, job assignment, force management, and human performance in weapons systems.

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

1. (U) Project 3816, Pilot Candidate Selection Method (PCSM): PCSM will provide assessment tools to enable the AF to select the best qualified applicants for Specialized Undergraduate Pilot Training (SUPT). PCSM will field a Test Processing Station and up to 250 computerized test stations, called Basic Attributes Testers (BATS), at AFROTC detachments, selected AF bases, and Military Entrance Processing Stations. Research by the Armstrong Laboratory has demonstrated that PCSM will produce test scores that are highly predictive of future pilot training performance.

(U) FY 1991 Accomplishments:
- (U) Produced 25 prototype BATS and software coding to verify and validate the new design.
- (U) Integrated a specialized training predictor into test battery.
- (U) Began development of the Test Processing Station which computes and compiles pilot applicant test data.

(U) FY 1992 Planned Program:
- (U) Conduct Equivalency Testing of the 25 prototype BATS.
- (U) Complete development of the Test Processing Station.
- (U) Conduct Operational Test and Evaluation.
- (U) Complete production of the PCSM test devices for ATC.

(U) FY 1993 Planned Program:
- (U) Develop improved predictor tests for the test battery.

(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 0804748F, Flight Screening.
(U) There is no unnecessary duplication of effort within the AF or the DoD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0604243F Budget Activity: #6 - Defense Wide Mission Support
PE Title: Manpower, Personnel, and Training Development

2. (U) Project 3817, Base Training System (BTS): The new and increasingly complex weapon systems and rapidly changing technology combined with major force reductions require personnel to be more efficient in the performance of their assigned duties. The AF needs a more efficient system for training management. BTS is a computerized management system for all enlisted specialty and officer and civilian ancillary training which will improve management, administration, scheduling, and record keeping. The system is composed of AF standard computer hardware and customized software.

(U) FY 1991 Accomplishments:
- (U) Awarded contract to begin full scale development of the BTS.
- (U) Conducted economic analysis of BTS Program.
- (U) Completed systems design.
- (U) Completed hardware installation at Randolph AFB.

(U) FY 1992 Planned Program:
- (U) Produce and install one BTS system at Randolph AFB.
- (U) Complete full scale development of the BTS.
- (U) Conduct operational test and evaluation of the BTS.
- (U) Prepare plans to support AF-wide implementation of BTS.

(U) FY 1993 Planned Program:
- (U) Complete Project Acquisition Strategy Approval Process for the BTS.
- (U) Conduct contract Source Selection for BTS.
- (U) Award BTS Production/Implementation Contract.

(U) Work Performed By: Project is managed by the Human Systems Division, Brooks AFB, TX. Contractors are: McDonald Douglas Training Systems, Aurora, CO; and Ball Systems Corp, Albuquerque, NM.

(U) Related Activities:
(U) PE 0603227F, Personnel, Training and Simulation Technology.
(U) There is no unrecessary duplication of effort within the AF or the DoD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 3818, Maintenance Skills Tutors (MST): MST will field multiple computer-based tutors for the Tactical Air Forces (TAF) to improve training of complex maintenance troubleshooting skills for a broad range of AF jobs. This is not initial skills training, but involves the more difficult skills of understanding and troubleshooting problems that the maintenance aiding equipment and systems are unable to diagnose. Significant additional funding was added to this project in FY 93 to support the new contract award for development of the common software and the tutor for F-16 flightline engine mechanics.

(U) FY 1991 Accomplishments:
- (U) Developed MST design options and life cycle cost estimates for hardware and software.
- (U) Determined that current TAC computer training hardware systems were not adequate to support future TAC requirements or MST requirements. Began evaluation of the projected hardware systems to be acquired under the Desk Top IV contract.

Program Element: #0604243F
PE Title: Manpower, Personnel, and Training Development

Budget Activity: #6 - Defense Wide Mission Support

(U) FY 1992 Planned Program:
- (U) Conduct trade-off analyses between design options to determine the optimal combinations of systems capability, supportability, and maintainability for MST.
- (U) Analyze development and life-cycle costs estimates for each design option and determine the most cost-effective system option for MST.
- (U) Develop and define a generic MST architecture design that identifies the software components which will be common to all tutor implementations, maximizes the re-use of code, and minimizes the development cost of each subsequent MST implementation.

(U) FY 1993 Planned Program:
- (U) Award contract to begin development of the MST common software and the development of a tutor for F-16 flightline engine mechanics.
- (U) Conduct cognitive task analyses to extract and quantify expert knowledge from TAC F-16 flightline engine mechanics.
- (U) Conduct Preliminary Design Review for the MST common software architecture.
- (U) Develop instructional content and design for the F-16 flightline engine mechanic tutor.
- (U) Conduct critical design review for the MST common software and the F-16 engine mechanic tutor.

(U) Work Performed by: Project is 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) There is no unnecessary duplication of effort within the AF or the DoD.

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604244F Project: #3182
PE Title: SRAM II Eng Development Budget Activity: #3 - Strategic Programs

Project Title: Short Range Attack Missile II

POPULAR NAME: SRAM II

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

| BUDGET | FY 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| ($000) | | | | |
| Major Contract | 106,741 | 0 | N/A | N/A |
| Support Contract | 30 | 0 | N/A | N/A |
| In-House Support | 5,249 | 0 | N/A | N/A |
| GFE/ Other | 31,420 | 0 | N/A | N/A |
| **Total** | 143,440 | 0 | 0 | 0 |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | (To Complete) |
| Program Milestones | N/A | Program Close out | N/A | N/A |
| Engineering Milestones | N/A | N/A | N/A | N/A |
| T&E Milestones | N/A | N/A | N/A | N/A |
| Contract Milestones | N/A | N/A | N/A | N/A |

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 was a supersonic, air-to-ground nuclear weapon that severely stressed the defensive threat. The combination of supersonic speed, low observability, and variable flight profile made SRAM II highly survivable in terminal defense zones. SRAM II significantly compounded enemy defense requirements and prevented optimization of defenses against low altitude subsonic targets.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Five successful live-firings led to completion of the rocket motor CDR in Aug 91.
   - (U) Continued B-2 integration and lab testing.
   - (U) Completed SRAM II/B-1B integration testing (including captive carry, static ejections, jettison and environmental) in preparation for the live launch phase of the flight test program.
   - (U) Completed Block A Operational Flight Software Formal Qualification Testing necessary for first live launch (Block A software represented 94% of final software).
   - (U) Completed OFS Delta Critical Design Review (CDR).
   - (U) Completed Delta CDR and technical interchange meeting for the Missile Guidance Computer and fabrication of two prototypes.

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

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

4. (U) Program to Completion: Not Applicable

D. (U) WORK PERFORMED BY: Boeing Aerospace and Electronics, Seattle, WA was the SRAM II prime contractor. Boeing Military Airplane, Seattle WA and Rockwell International, El Segundo CA were to integrate the SRAM II onto the B-1B; Northrop, Pico Rivera CA were to integrate the SRAM II onto the B-2.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: Not Applicable

2. (U) Schedule Changes: President directed program termination. Present plans project close out as soon as possible.

3. (U) Cost Changes: President directed program termination. FY92 close out funding as shown in Part A.

Program Element: #0604244F
PE Title: SRAM II
Project: #3182
Budget Activity: #3-Strategic Programs

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) SRAM II DCP, SECRET-FRD, 2 Jun 87
- (U) SRAM II TEMP w/ANNEX,SECRET, Mar 89
- (U) SAC SORD 14-82 II/III, SECRET, 24 Jun 91
- (U) SRAM II PMD, UNCLASSIFIED, 4 Oct 91

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 was to be developed for internal carriage on the B-1B (PE #0604226F) and B-2 (PE #0604240F).
- (U) No follow-on effort is required.

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

| | FY1991 Actual | FY1992 Estimate | FY1993 Estimate | To Compl | Total Pgm |
|---|---|---|---|---|---|
| 20XX | 10.1 | N/A | N/A | N/A | 14.4 |
| 30XX | 0.0 | N/A | N/A | N/A | 6.4 |
| 26XX | 0.0 | N/A | N/A | N/A | 0.0 |
| Total | 10.1 | 0.0 | 0.0 | 0.0 | 20.8 |

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

Program Element: #0604244F
PE Title: SRAM II
Project: #3182
Budget Activity: #3-Strategic Programs

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 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 jettison and separation characteristics |
| Completed six inflight jettison tests from aft B-1B weapons bay | 25 Jan 90 - 29 Nov 90 | Verified acceptable jettison and separation characteristics |
| Completed three captive carry integration tests | 13 Nov 90 - 11 Dec 90 | Verified proper integration of missile and B-1B hardware and software |
| Completed eight aft bay jettison tests | May 91 | Verified acceptable jettison and separation characteristics |
| Completed eight captive carry integration tests | Jul 91 | Verified proper integration of missile and B-1B hardware and software |
| Completed four jettison and environment tests from forward weapons bay of B-1B | Aug 91 | Verified acceptable integration of missile in any B-1B weapons bay |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604245F
PE Title: SRAM T Eng Development
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 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| ($000) | | | | |
| Major Contract | 22,000 | 0 | N/A | N/A |
| Support Contract | 0 | 0 | N/A | N/A |
| In-House Support | 200 | 0 | N/A | N/A |
| GFE/ Other | 4,484 | 0 | N/A | N/A |
| **Total** | 26,684 | 0 | 0 | 0 |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | (To Complete) |
| Program Milestones | N/A | Program Close out | N/A | N/A |
| Engineering Milestones | N/A | N/A | N/A | N/A |
| T&E Milestones | EVFA Completion | N/A | N/A | N/A |
| Contract Milestones | N/A | N/A | N/A | N/A |

Program Element: #0604245F
PE Title: SRAM T
Project: 3951
Budget Activity: #4-Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The Short Range Attack Missile - Tactical (SRAM T) was the 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) offered the least costly, most timely, and lowest risk option for meeting the tactical nuclear standoff weapon requirement. This modified SRAM II was designated SRAM T. Its extended range would have enabled aircraft to avoid enemy air defenses at or beyond the forward line of troops, as well as standoff from terminal area target defenses. The combination of supersonic speed, low observability, and variable flight profiles made the SRAM T a highly survivable weapon and significantly compounded enemy defense requirements. The required SRAM T performance modifications are attainable with existing technology.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Completed F-15E early vibration fly around and wind tunnel testing
   - (U) Began fabrication of SRAM T ground test missiles.
   - (U) Completed PDR on F-15E adapter hardware.

2. (U) FY 1992 Planned Program: Not Applicable (FY 1992 contract termination expenses funded in PE 0604244F)

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

4. (U) Program to Completion: Not Applicable

D. (U) WORK PERFORMED BY: Boeing Aerospace and Electronics, Seattle, WA was to modify SRAM II for the tactical mission. McDonnell Douglas Aircraft Company, St. Louis, MO was to integrate the SRAM T onto the F-15E.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: Not Applicable

2. (U) Schedule Changes: President directed SRAM II program termination, therefore, the SRAM T derivative was also cancelled. Present plans project close out as soon as possible.

3. (U) Cost Changes: Not Applicable

Program Element: #0604245F
PE Title: SRAM T
Project: 3951
Budget Activity: #4-Tactical Programs

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
- (U) SRAM T PMD, Unclassified, 7 Oct 91

G. (U) RELATED ACTIVITIES:

- (U) The parent SRAM II design was being developed under the SRAM II Engineering Development program (PE #0604244F)
- (U) No follow-on effort has been defined.

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

- (U) F-15E modification production funding (3010) would have been included in PE #0207134F.
- (U) SRAM Missile Procurement (BA 4201) BPAC #633182, PE #11218F (Weapon System Only) (qty: 565)
- (U) P-1 #3020, 20XX, System
- (U) P-1 #3020, 30XX, Advance Buy
- (U) P-1 #3020, 26XX, Spares
- (U) Engineering to build an adapter to hang the missile in the $WS^3$ vault, PE #0208030, was contained within the SRAM T FY92 and FY93 programs

| | FY1991 Actual | FY1992 Estimate | FY1993 Estimate | To Compl | Total Pgm |
|---|---|---|---|---|---|
| 3010 | 0.0 | N/A | N/A | N/A | 0.0 |
| 20XX | 0.0 | N/A | N/A | N/A | 0.0 |
| 30XX | 0.0 | N/A | N/A | N/A | 0.0 |
| 26XX | 0.0 | N/A | N/A | N/A | 0.0 |
| 3080 | 0.0 | N/A | N/A | N/A | 0.0 |
| Total | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: 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 UK TASM solution.

Program Element: #0604245F
PE Title: SRAM T
Project: 3951
Budget Activity: #4-Tactical Programs

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

| Event | Date | Results |
|---|---|---|
| Completed 110 hours of loads and F-15E/SRAM T wind tunnel tests characteristics | Dec 90 | Preliminary interface store separation |
| Completed F-15E early vibration obtained fly around tests | Nov 90 | Successful; data |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2693 LANTIRN | 1,692 | 1,786 | 1,800 | 1,500 | 532,410 |
| 3920 Night Attack Program | 5,112 | 24,595 | 25,100 | 39,900 | 100,980 |
| Total | 6,804 | 26,381 | 26,900 | 41,400 | 633,390 |

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 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 1991 Accomplishments:
- (U) Continued integration and development flight testing of LANTIRN/ F-15E and the F-16 Block 40/42 production aircraft.
- (U) Implemented flight test software changes resulting from initial operational use of the targeting pod.

(U) FY 1992 Planned Program:
- (U) Evaluate and test high altitude laser capabilities.
- (U) Identify corrective actions to discrepancies identified in field service reports and Desert Storm operations.

Program Element: #0604249F Budget Activity: 1. - Tactical Programs
PE Title: Night/Precision Attack

- (U) Flight test evaluation for image motion, area track and time tagging issues on the F-16 and F-15E aircraft.
- (U) Determine IFF capability potential to control friendly fire.

(U) FY 1993 Planned Program:
- (U) Flight test software changes resulting from anticipated changes in the F-16 and F-15E software suites.
- (U) Identify corrective actions to service reports submitted by the field units.

(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 Sundstrand 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 McDonnell 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 06/07):

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 191,991 | 5,322 | 4,149 | 982 | 3,287,141 |
| Qty | | | | | |
| Nav Pods | 0 | 0 | 0 | 0 | 561 |
| Tgt Pods | 65 | 0 | 0 | 0 | 506 |

(U) International Cooperative Agreements: Not Applicable.

FY 1993 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 Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Night Attack Program | 5,112 | 24,595 | 25,100 | 39,900 | 100,980 |

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. In order to best support the Army's AirLand Battle Doctrine, the Air Force must have an aircraft that is capable of conducting continuous CAS and Battlefield Air Interdiction, including day/night and under-the-weather operations. The Night Attack Program (NAP) will develop, test, and evaluate night vision technologies for future enhancement to F-16 and A-10 aircraft. For F-16s, the program will also integrate, procure, and retrofit a Head Steered Infrared system (HSIR), Helmet Mounted Display (HMD), and a fixed low light level TV.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Refined specifications for head-steered infrared systems.
   - (U) Investigated improvements to existing IR technology.
   - (U) Refined specifications for HMD/Helmet Mounted Sight (HMS) and head position sensing systems.
   - (U) Evaluated automatic Maverick missile handoff techniques for the CAS/BAI mission.
   - (U) Initiated HMD data concept studies.

2. (U) FY 1992 Planned Program:
   - (U) RFP for HSIR/HMD system will be released (May 1992) and source selection conducted following proposal preparation.
   - (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 HSIR/HMD system in the F-16 aircraft.
     -- (U) Structural considerations to fit IR system into nose of aircraft.
     -- (U) Cockpit modifications to accommodate IR/HMD additions.
     -- (U) Environmental control system redesign to accommodate HSIR/HMD system.
     -- (U) Core computer avionics modifications required to support HSIR/HMD system (hardware and software)
     -- (U) Technical milestone: system requirements review.
   - (U) Contractor develops two contract change proposals to support Engineering Manufacturing Development (EMD) and production long lead efforts.

Program Element: # 0604249F
PE Title: Night Precision Attack
Project Number: # 3920
Budget Activity: #4 - Tactical Programs

- (U) Demonstrate low light level television technology for F-16D training.

3. (U) FY 1993 Planned Program:
   - (U) Award contract for development/integration phase.
   - (U) Start EMD for an HSIR/HMD system.
   - (U) Conduct Preliminary Design Review (PDR) and System Design Review (SDR) for subsystem and aircraft.
   - (U) Fabricate laboratory HSIR/HMD mock-up units.
   - (U) HMD ejection compatibility testing.

4. (U) Program to Completion:
   - (U) EMD will continue into FY 1996.
   - (U) Conduct Critical Design Review (CDR) for subsystem and aircraft
   - (U) Conduct HMD safety of flight testing.
   - (U) Complete software development.
   - (U) Conduct flight test aircraft modification.
   - (U) Conduct test readiness review.
   - (U) Integrate and test HMD and Infrared system.
   - (U) Conduct Production Readiness Review (PRR).
   - (U) Authorize contract for long lead and full production go ahead.
   - (U) Develop tooling fabrication.
   - (U) First aircraft delivered with HSIR/HMD in December 1997.

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 1992/93.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Not Applicable.
2. (U) SCHEDULE CHANGES: Post Desert Storm requirement review revalidated the need for this program, but has delayed issuance of a Request For Proposal.
3. (U) COST CHANGES: Not Applicable.

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.

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: Not applicable.

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

Program Element: # 0604249F
PE Title: Night Precision Attack

Project Number: # 3920
Budget Activity: #4 - Tactical Programs

J. (U) MILESTONE SCHEDULE

| | | |
|---|---|---|
| 1. | (U) SRR | Apr 92 |
| 2. | (U) RFP | May 92 |
| 2. | (U) Source Selection complete | Dec 92 |
| 3. | (U) Start EMD | Feb 93 |
| 4. | (U) Long Lead Production authorization | Feb 95 |
| 5. | (U) First Aircraft Modified | Dec 97 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604250E 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3389 Integrated Electronic Warfare System (INEWS) Pre-EMD | 924 | 0 | 0 | 0 | 145,470 |
| 3393 Integrated Communications, Navigation, Identification Avionics (ICNIA) Pre-EMD | 4,148 | 0 | 0 | 0 | 58,042 |
| 3786 Integrated Communications Security (COMSEC) | 4,850 | 0 | 0 | 0 | 32,416 |
| Total | 9,922 | 0 | 0 | 0 | 235,928 |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This element funds advanced avionics development programs with specific application to the Advanced Tactical Fighter (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-EMD 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 EMD, these modules will be developed into Joint Integrated Avionics Working Group (JIAWG) compliant modules for use in the Common Avionics Baseline architecture.

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

1. (U) Project 3389 INEWS Pre-EMD: 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.

   (U) FY 1991 Accomplishments:
   - (U) Completed data analysis and reporting.
   - (U) Closed out project.

   (U) FY 1992 Planned Program: Not Applicable.

   (U) FY 1993 Planned Program: Not Applicable.

   (U) Work Performed By: Air Force Systems Command, Aeronautical Systems Division, Electronic Warfare and Reconnaissance Program Office, Wright Patterson AFB, OH. Major contractors in pre-EMD efforts are Sanders/General Electric INEWS Joint Venture Team, Nashua NH. and TRW/Westinghouse INEWS Joint Venture Team, San Diego, CA and Baltimore, MD.

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 (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.

2. (U) Project 3393 ICNIA Pre-EMD: Transitions tri-service ICNIA development program results funded under PE 0603109F to EMD. 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 1991 Accomplishments:
- (U) Completed Common Module Program with delivery of initial module specification
- (U) Completed FY 90 efforts.
- (U) Closed out project.

(U) FY 1992 Planned Program: Not Applicable.

(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, National Security Agency (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.

Program Element: #0604250F
Budget Activity: #4 - Tactical Programs
PE Title: Integrated Electronic Warfare/Communications Navigation Identification (EW/CNI) Development

(U) FY 1991 Accomplishments:
- (U) Completed initial AACU development.
- (U) Formalized JIAWG definition of common COMSEC interfaces and AACU standard.
- (U) Finalized security risk assessments and NSA review of weapon system INFOSEC designs.
- (U) Closed out project.

(U) FY 1992 Planned Program: Not Applicable.

(U) FY 1993 Planned Program: Not Applicable.

(U) Work Performed By: In-house work by NSA, Fort Meade MD. 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.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Aircraft Engine CIP | 89,454 | 112,848 | 111,720 | 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 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.

1. (U) FY 1991 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 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/analysis tasks; 69 repair tasks), generating an estimated $1.7B LCC savings.
   - (U) F100 (F-15/F-16): Continued design of new nozzle logic control mode change to incorporate Control Mode Optimization (CMO) in digital engine control to increase rotor life by 40%, stall margin by 10%, and thrust response by 20%; reduce scheduled engine removals, resulting in a revised $516.0M LCC savings.

Program Element: #0604268F
PE Title: Aircraft Engine Component Improvement Program (CIP)
Project Number: N/A
Budget Activity: #4 - Tactical Programs

- (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 3%, and reduce maintenance manhours by 6% resulting in a revised $80.0M LCC savings.
- (U) F110 (F-16): Continued exhaust nozzle liner redesign 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): Deferred Engine Structural Integrity Life Improvement effort to improve the residual lives of fracture critical parts ($46.1M LCC savings) to FY 1992 (higher priority flight safety issue with fan blade failures).

2. (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 7,634 ground test hours (6,440 sea level test hours; 1,194 altitude test hours) and 140 flight test hours to analyze, verify, and approve 628 CIP tasks (234 redesign tasks; 312 repair tasks; 82 analysis tasks), generating an estimated $3.1B LCC savings.
- (U) F100 (F-15/F-16): Design a new copper/nickel plasma spray coating for the bearing surfaces of titanium disk retention lugs to prevent galling which induces disk lug fractures and subsequent engine damage, results in $37.0M LCC savings.
- (U) TF30 (F-111): Complete redesign of 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 3%, and reduce maintenance manhours by 6% resulting in a $80.0M LCC savings.
- (U) F110 (F-16): Redesign high pressure compressor variable stator vane to prevent lever arm pin disengagement and subsequent engine damage, resulting in a $71.8M LCC savings.
- (U) F101 (B-1): Complete redesign of the first stage fan damper and fatigue analysis program to address a blade resonant frequency problem which leads to fatigue failures of the blade, number one safety concern for the F101.

3. (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 7,875 ground test hours (6,643 sea level test hours; 1232 altitude test hours) and 144 flight test hours to analyze, verify, and approve 641 CIP tasks (238 redesign tasks; 319 repair tasks; 84 analysis tasks), generating an estimated $2.7B LCC savings.
- (U) F100 (F-15/F-16): Redesign F100-PW-229 flameholder to permit retrofit into all F100 models to improve commonality, reduce spares costs, and improve durability, generating an estimated $53.0M LCC savings.
- (U) F110 (F-16): Redesign the #3 bearing to provide lubrication under the bearing race to reduce bearing operating temperature and increase bearing life during oil starvation generating an estimated $39.5 LCC savings.

Program Element: #0604268F
PE Title: Aircraft Engine Component Improvement Program (CIP)
Project Number: N/A
Budget Activity: #4 - Tactical Programs

- (U) TF30 (F-111): Redesign the first turbine vane cooling cavities to eliminate localized high temperature distress, resulting in a 15% reduction in unscheduled engine removals and generating an estimated $25.0M LCC savings.

4. (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 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: FY 1991 funding was reduced by a net of $.776M by Congressional direction and additional F101 engine work. FY 1992/1993 were reduced $1.253M/$6.020M to reflect inflation and contract management adjustments and Congressional action.

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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604270F
PE Title: EW Development

Budget Activity: # 4 - Tactical Programs

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Comp | Total Prog |
|---|---|---|---|---|---|
| 1627 Sim, Analysis and Eval | 487 | 300 | **** | ----- | ----- |
| 2066 EF-111A SIP | 17137 | 72116 | 59600 | Cont | TBD |
| 2272 ALE-47 CMDS | 5950 | 2500 | 3900 | 0 | 31000 |
| 2274 Advanced CM (QRC 85-04) | 1000 | 200 | 0 | 0 | 3153 |
| 2462 COMPASS CALL | 9450 | 34200 | 33600 | Cont | TBD |
| 2719 F-16/ASPJ Integration | 13912 | 0 | 0 | 0 | 14137 |
| 2827 F/FB/EF-111 RWR * | 495 | 0 | 0 | 0 | N/A |
| 2879 EWIR | 2450 | 0 | 0 | 0 | 7392 |
| 3108 Airlift Defensive Systems | 7 | 5700 | 4900 | 9750 | 32475 |
| 3660 AFECO | 1310 | 1500 | 1000 | Cont | N/A |
| 3894 JSTARS/SDS | 2000 | 30700 | ***** | ----- | ----- |
| 3896 Adv Strat/Tac IR Exp | 4393 | 8950 | 9700 | Cont | TBD |
| 4076 OBEWS ** | 0 | 1900 | 14400 | 45700 | 62000 |
| 4077 *Adv Missile Warning* *** | 0 | 13500 | 12160 | Cont | TBD |
| 5618 F-15 Protective Systems | 20506 | 25944 | 19240 | Cont | TBD |
| TOTAL | 79097 | 197510 | 158500 | Cont | N/A |

* EF-1111 RWR was incorporated into project 2066 in FY 1992.
** OBEWS was in project number 2272 in FY 1991 and prior years.
*** Advanced Missile Warning was in PE 0604250F, project number 3858 in FY 1991 and prior years.
**** Tasks and Funding Transfered to B-1B PE 0604226F in FY 1993.
***** Tasks and Funding Transfered to JSTARS PE 0604770F in FY 1993.

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 Engineering and Manufacturing Development (EMD) programs. (Technology base/advanced development efforts are funded in PE-0603270F, Electronic Combat Technology.)

CLASSIFIED BY: Multiple Sources
DECLASSIFY ON: OADR

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270F  Project: #2066

PE Title: EW Development  Budget Activity: #4 - Tactical Programs

Project Title: EF-111A System Improvement Program

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

| BUDGET | FY 1991 | FY1992 | FY1993 | To Complete |
|---|---|---|---|---|
| ($000) | | | | |
| Major Contract | 8125 | 59655 | 50100 | Cont |
| Support Contract | 4340 | 4841 | 3800 | Cont |
| In-house Support | 843 | 2612 | 1500 | Cont |
| GFE/Other | 3829 | 5008 | 4200 | Cont |
| Total | 17137 | 72116 | 59600 | Cont |
| SCHEDULE | FY 1991 | FY1992 | FY1993 | To Complete |
| Program Milestones | MS II - Mar 91 | None | None | MSIII - 3QFY96 |
| Engineering Milestones | DSS SDR - May 91<br>DSS PDR - Aug 91 | DSS CDR - Mar 92<br>Exciter PDR - May 92<br>Band 4 PDR - May 92<br>Band 4 CDR - Aug 92 | Exciter CDR - Oct 92<br>DSS Acft Install - Apr 93 | Exciter Acft Install - 3QFY94 |
| T&E Milestones | None | None | TEMP Approval - 2QFY93<br>DSS CT&E -4QFY93 | DSS DT&E- 1QFY94<br>Band 4 DT&E-1QFY94<br>Band 4 IOT&E- 1QFY94<br>Exciter DT&E- 2QFY95<br>SIP IOT&E - 3QFY95 |
| Contract Milestones | DSS EMD CA-Mar 91<br>Exciter Demo CA-Mar 91<br>Band 4 EMD CA-Aug 91 | Exciter EMD CA-Nov 91 | None | Band 4 Prod CA-3QFY94<br>DSS Prod CA-3QFY96<br>Exciter Prod CA-3QFY96 |

Program Element: #0604270F
PE Title: EW Development
Project Number: 2066
Budget Activity: #4 - Tactical Programs

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 modern 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 encoder processor, 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). 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 1991 Accomplishments:
   - (U) Initiated Engineering & Manufacturing Development (EMD) of TJS upgrade
   - (U) Completed Band 4 modification kit design specification and awarded EMD contract to start design effort.
   - (U) Accomplished System Design Review and Preliminary Design Review for encoder processor, data bus and Ada based operation flight program (Digital Subsystem).
   - (U) Successfully completed exciter risk reduction effort.
   - (U) Began studies of ALR-62I RWR integration, narrow beam antenna and Band 1/2 directivity.

2. (U) FY 1992 Planned Program:
   - (U) Continue EMD of TJS.
   - (U) Accomplish Critical Design Review for Digital Subsystem.
   - (U) Fabricate System Integration Laboratory (SIL) and begin integration and test of Digital Subsystem components.
   - (U) Continue Band 4 transmitter development by accomplishing Preliminary Design Review and Critical Design Review.
   - (U) Begin fabrication of prototype Band 4 transmitters.
   - (U) Begin Exciter EMD.
   - (U) Conduct Exciter Preliminary Design Review.
   - (U) Complete studies of ALR-62I RWR integration, narrow beam antenna and Band 1/2 directivity.

3. (U) FY 1993 Planned Program:
   - (U) Complete fabrication of Digital Subsystem and continue SIL testing.
   - (U) Begin Digital Subsystem Qualification tests and CT&E.
   - (U) Conduct Exciter Critical Design Review and begin fabrication of Exciters.
   - (U) Begin SIL integration and test of Exciter components.
   - (U) Conduct Band 4 qualification test and trial installation.

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

D. (U) Work Performed By: Sacramento Air Logistics Center, Sacramento, CA is the overall manager of the EF-111A SIP effort, and will directly manage the production and installation of the permanent modification of the EF-111 aircraft. Air Force Systems Command, Aeronautical Systems Division, Wright-Patterson AFB, OH, will manage the Digital Subsystem and Exciter development contract. Prime contractor is Grumman Aerospace Corp, Bethpage, NY. The

Program Element: #0604270F
PE Title: EW Development
Project Number: 2066
Budget Activity: #4 - Tactical Programs

Band 4 upgrade will be managed by Warner-Robins Air Logistics Center, Robins AFB, GA. Prime contractor for Band 4 transmitter upgrade is Motorola Corp, Scottsdale, AZ.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: Band 1/2 improvement study was delayed.
3. (U) COST CHANGES: Revised cost estimates necessitated an increase of $2.9M in FY91. Funding was reduced in FY93 by $13.3M due to higher priorities, delaying some work to the outyear.

F. (U) PROGRAM DOCUMENTATION:
(U) TAC SON 319-88, (S) dated 23 Oct 89
(U) TAC SON 337-88, (S) dated 15 Sep 89
(U) TAF SORD 319-88-I/II-A (Revision 1), (S-NF-WN-NC) dated 20 Jun 91

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.

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 |
|---|---|---|
| None | | |

T&E ACTIVITY (TO COMPLETION)

| Event | Date | Remarks |
|---|---|---|
| TEMP approval | 2QFY93 | |
| Digital Subsystem DT&E | 1QFY94 | |
| Band 4 DT&E | 1QFY94 | |
| Band 4 IOT&E | 1QFY94 | |
| Exciter DT&E | 2QFY95 | |
| Digital Subsystem & Exciter IOT&E | 3QFY95 | |

Program Element: # 0604270F
PE Title: EW Development

Budget Activity: # 4 - Tactical Programs

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

1. (U) Project 2272, ALE-47 Countermeasures Dispenser System (CMDS):
This project develops the ALE-47 CMDS system for the F-16 Block 40 and 50 retrofit installations. The ALE-47 CMDS is a Joint AF (lead) and Navy program to develop an inter :tive/smart expendables dispenser for the F-16 and numerous Navy aircraft. The Army is evaluating the use of ALE-47 system components to enhance their aircraft's expendable dispenser systems.

(U) FY 1991 Accomplishments:
- (U) Completed engineering and fabrication testing.
- (U) Received delivery of 34 EMD test support systems.
- (U) Started DT&E (May 91).
- (U) Redirected program to remove testing and production schedule concurrency.
- (U) Extended EMD contract to remove schedule concurrency.

(U) FY 1992 Planned Program:
- (U) Complete DT&E and begin IOT&E of the EMD system (Jun 92).
- (U) Exercise long lead Lot I Production option following successful DT&E (Jun 92).
- (U) Begin development of depot level support equipment.

(U) FY 1993 Planned Program:
- (U) Complete IOT&E of EMD system (Dec 92).
- (U) Complete development of depot level support equipment.
- (U) Exercise Lot I Production option (Feb 93).
- (U) Begin delivery of Lot I (4 Qtr 93).

(U) Work Performed By: Air Force Systems Command, Aeronautical Systems Division, Wright-Patterson AFB, OH, will manage the program. Tracor, Austin TX has a FFP contract to accomplish the ALE-47 CMDS EMD and four production lots.

(U) Related Activities:
- (U) PE 0207133F, F-16 Squadrons
- (U) PE 0604270N, project number W0638, Electronic Warfare Development
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriations Funds ($ In Thousands):
(U) Procurement (Acft):

| PE 0207133F | FY 1991 Actual | FY1992 Estimate | FY1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| F-16 | 7,700 | 4,600 | 2,400 | 0 | 14,700 |
| F-16 Mods | 0 | 11,900 | 14,900 | 85,500 | 112,300 |
| Quantity | 0 | 93 | 108 | 488 | 689 |

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0604270F
PE Title: EW Development

Budget Activity: #4 - Tactical Programs

2. (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 1991 Accomplishments
- (U) Completed fabrication units #2 and #3.
- (U) Certified for flight test on F-111 and QF-100.
- (U) Accomplished F-111 Flight testing
- (U) Completed 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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270E
PE Title: EW Development
Project Number: 2462
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ( $ in Thousand)

| Project Title / Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| COMPASS CALL | 9,450 | 34,200 | 33,600 | Cont | TBD |

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

This project provides engineering development of jammers to [ ] network. 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 1991 Accomplishments:
   - (U) Completed design and testing of Low-Band [ ] transmit antenna upgrade kit.
   - (U) Demonstrated the power handling capability and robustness of a single spigot radial combiner RF distribution design.
   - (U) Demonstrated the new capability of the High-Band [ ] subsystem.
   - (U) Demonstrated the capability of automatically acquiring and identifying additional new High Band signals of interest.
   - (U) Initiated the development effort to design a "common receiver."
   - (U) Demonstrated the integrated High-Band subsystem which was derived from various previous stand-alone subsystems.
   - (U) Awarded contract to provide [ ] capability to the aircraft platform.

2. (U) FY 1992 Planned Program:
   - (U) Award contract for incorporation of the Low-Band [ ]
   - (U) Continue the upgrades to the jamming waveform algorithms.
   - (U) Begin Engineering and Manufacturing Development (EMD) of low/mid/high band RF distribution jamming system program.
   - (U) Continue integration of High-Band [ ] program.
   - (U) Continue EMD of [ ]
   - (U) Award an EMD contract to [ ]
   - (U) Begin Mission Simulator Mission Generation system improvement efforts.

3. (U) FY 1993 Planned Program:
   - (U) Continue the upgrades to the jamming waveform algorithms. Test and evaluate the new jamming waveforms that have been added to the jam exciter subsystem.
   - (U) Continue low/mid/high band RF distribution jamming system upgrade. Complete critical design review.
   - (U) Complete High-Band System/System Support Facility integration. Continue with aircraft

Program Element: #0604270F
PE Title: EW Development

Project Number: 2462
Budget Activity: #4 - Tactical Programs

integration and preparation for flight tests.
- (U) Continue development of the [ ] capability. Demonstrate [ ]
- (U) Conduct flight tests of Low Band DF system improvements.
- (U) Conduct critical design review of [ ]

4. (U) Program to Completion:
- (U) Continue upgrades to jamming waveform algorithms.
- (U) Incorporate new "generic" receiver for improved logistics and signal detection.
- (U) Integrate High-Band System into aircraft platform. Perform airborne DT&E.
- (U) Complete, accept, and receive contract deliverables from the High-Band System EMD contract.
- (U) Integrate [ ]
- (U) Complete, accept, and receive contract deliverables from the [ ] contract.
- (U) Integrate and test low/mid/high band RF distribution jamming system.
- (U) Integrate and flight test [ ] capability.
- (U) Complete, accept, and receive contract deliverables [ ] contract.
- (U) Design, develop, integrate, and test [ ]
- (U) Provide interim contractor support for aircraft Block 3 pre-production subsystems.
- (U) Provide interim contractor support for aircraft Block 4 pre-production subsystems.
- (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; Magnavox, Ft Wayne, IN; and GTE, Mt View, CA.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: RF Distribution Jamming system upgrade has slipped one year as a result of TAC prioritizing the funding of it behind the Mission Simulator Mission Generation support effort. Fielding of product improvements have also been consolidated into "Block Upgrades". The first Block Three aircraft is scheduled for delivery in Dec 94 (1Q/FY 95). The first Block Four aircraft is scheduled for FY 97.

3. (U) COST CHANGES: FY 93 request lowered due to revised cost estimate.

F. (U) PROGRAM DOCUMENTATION:

- (U) TAF SORD 318-88 1/11/111-A for Counter C3 in Support of Defense Suppression, 16 Mar 90.

G. (U) RELATED ACTIVITIES:
- (U) PE 0603270F, Electronic Combat Technology, provides technology development. COMPASS CALL, PE 0207253F, procures the system hardware.

Program Element: #0604270F
PE Title: EW Development

Project Number: 2462
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 (BA 3010)($ In Thousands):

| PE 0207253F | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| | 19,900 | 33,499 | 85,315 | Cont | - |

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

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. (U) | Awarded contract to provide situation awareness and jam management capability to aircraft platform. | 1Q/FY 91 |
| 2. (U) | Awarded contract to complete design and testing of Low-Band antenna upgrade kit. | 1Q/FY 91 |
| 3. (U) | Contract for the engineering manufacturing and development of the High-. Band subsystem. | 1Q/FY 92 |
| 4. (U) | Conduct critical design review of High Band subsystem. | 2Q/FY 92 |
| 5. (U) | Conduct critical design review of [ ] program. | 3Q/FY 92 |
| 6. (U) | Award competitive contract for the low-band portion of the jamming system improvements. | 4Q/FY 92 |
| 7. (U) | Conduct critical design review of [ ] program. | 1Q/FY 93 |
| 8. (U) | Complete High Band subsystem software test and integration. | 3Q/FY 93 |
| 9. (U) | Conduct system support facility integration testing of [ ] | 4Q/FY 93 |
| 10. (U) | Acceptance testing on JM/SA software development facility. | 4Q/FY 93 |
| 11. (U) | Award contract to provide high band exciter improvements. | 2Q/FY 94 |
| 12. (U) | Complete FH/CM integration into system support facility. | 3Q/FY 94 |
| 13. (U) | Complete High Band subsystem CONUS test. | 4Q/FY 94 |
| 14. (U) | Complete [ ] | 4Q/FY 94 |
| 15. (U) | Complete [ ] | 1Q/FY 95 |
| 16. (U) | Field "direction finding" changes. | 1Q/FY 95 |
| 17. (U) | Begin [ ] | 1Q/FY 95 |
| 18. (U) | Begin fielding high-band integration. | 1Q/FY 95 |
| 19. (U) | Complete High Band subsystem OCONUS test.. | 2Q/FY 95 |
| 20. (U) | Complete [ ] | 2Q/FY 95 |
| 21. (U) | Complete JM/SA contract. | 4Q/FY 95 |
| 22. (U) | Complete FH/SA contract. | 2Q/FY 96 |
| 23. (U) | Complete High Band subsystem contract. | 3Q/FY 96 |
| 24. (U) | Begin fielding low-band jamming system improvements. | FY 97 |
| 25. (U) | Begin fielding mid/high-band jamming system improvements. | FY 97 |

Program Element: #0604270F
Project Title: EW Development

Project Number: 3108
Budget Activity: #4 - Tactical Programs

3. (U) Project 3108, Airlift Defensive Systems (ADS):
This project provides for the development and prototype of a common defensive system (AAR-47 Missile Warning Receiver; ALE-40 or 47 Countermeasures Dispenser) on tactical and strategic airlift aircraft, specifically the C-17, C-27, 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.

(U) FY 1991 Accomplishments:
- (U) Congressional direction given to have Snowstorm serve as ADS prototpye. Project Snowstorm was an FY 90 funded effort. FY 91 ADS funding was reprogrammed to higher priority programs.
- (U) Completed modification on all C-130 (18) and C-5 (2) Snowstorm aircraft despite delays due to Operation Desert Storm.
- (U) Identified need to change C-141 from AAR-44 to AAR-47 missile Warning System under Snowstorm Testing.
- (U) Engineered design of AAR-44 on C-141 and delivered first of three Snowstorm aircraft for installation.
- (U) Continued OT&E of Snowstorm aircraft.

(U) FY 1992 Planned Program:
- (U) Complete Flight test of C-141 Snowstorm prototype.
- (U) Begin feasibility testing of ALE-47 sequencer switch on C-141 for optimization of chaff/flare sequencing.
- (U) Increase AAR-47 processor memory.
- (U) Start C-130 modification as AFRES ADS contract option.
- (U) Start Prototype installation and testing of ALE-47 on C-130 and C-141 aircraft.
- (U) Complete design review of C-141 and begin procurement process.
- (U) Define needs and continue plans to include AFRES and NGB aircraft in ADS program.
- (U) Add NGB C-130 aircraft to installation schedule.
- (U) Begin C-141 simulator modification.
- (U) Continue OT&E of Snowstorm aircraft.

(U) FY 1993 Planned Program:
- (U) Prototype installation of ALE-47 on C-5 aircraft.
- (U) Complete design review of C-5 and begin procurement process.
- (U) Begin kitproof and installation of C-141.
- (U) Begin C-27 initial engineering effort.

(U) Work Performed By: The Airlift Defensive Systems (ADS) Program Manager is the Air Force Logistics Command (Air Force Material Command, 1 Jul 92), Wright-Patterson AFB, OH. The C-130 AFRES ADS prime contractor is Aero Systems, Memphis, TE. Options on this contract will be exercised for MAC and NGB ADS requirements. Both C-141 and C-5 ADS contracts will be complete with options for AFRES/NGB requirements. The C-27 plans to utilize their existing modification contract for the ADS modification. C-17 ADS prime contractor TBD.

(U) RELATED ACTIVITIES:
(U) PE-0401330F, C-17 Program
(U) PE-0401115F, C-130 Airlift Squadrons
(U) PE-0401118F, C-141 Airlift Squadrons

Program Element: #0604270F
Project Title: EW Development

Project Number: 3108
Budget Activity: #4 - Tactical Programs

(U) PE-0401119F, C-5 Airlift Squadrons
(U) PE-0404011F, Special Operations Forces
(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 (BP1100 Aircraft Modification):

| | FY1991 Actual | FY1992 Estimate | FY1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Airlift Defensive Systems | 0 | 8,300 | 15,300 | 30,500 | 54,100 |

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

Program Element: #0604270F
PE Title: EW Development

Budget Activity: #4 - Tactical Programs

4. (U) Project: 3660, Air Force Electronic Combat Office (AFECO).
It's purpose is to focus USAF Electronic Combat acquisition and upgrade programs; integrate the planning, development, production, life cycle support and modification of USAF Electronic Combat systems and ensure the EC programs are technically executable to meet the user's needs and ensure the EC Test Process is implemented. This is a joint AFSC/AFLC organization.

(U) FY 1991 Accomplishments:
- (U) Continued support to EC program offices:
  -- (U) B-1B SPO, ASD/RW, F-16 SPO, ATF SPO.
  -- (U) Completed Draft Technology Roadmap for ASTE Program.
  -- (U) Independent review of F-15 ALQ-135 Program.
  -- (U) Independent review of AWACS ESM System.
  -- (U) Support JSTARS Self-Protection Requirements O-6 Working Group.
- (U) Published AF Development EC Test Process Guide.
- (U) Started development of EC Test Handbooks.
- (U) Conducted EC Test Process training sessions.
- (U) EC Test Resources Planning and Development:
  -- (U) Completed EC Test Investment Strategy Study.
  -- (U) Supported the General Officer EC T&E Visions Process; the DT&E Corporate Board; EC TIPP Process; and EC Reliance processes.
- (U) Managed, Upgraded and Distributed Common EC Computer Simulations.
  -- (U) Established and Promoted Common DoD Modeling & Simulation Architecture.
- (U) Developed EW Data Base, prototype system.
- (U) Led development of an AF EC Test Investment Strategy.
- (U) Completed studies and analysis for:
  -- (U) B-1B RWR Comparison Test Plan.
  -- (U) B-1B ECM/Radar Cross Section Trade-off.
  -- (U) HPCM Technology Assessment.
  -- (U) Draft Planning Guide for Tactical Aircraft Self-Protection.
  -- (U) MWS Sensor Optimizations for C-141 and C-141 SOLL II Aircraft.
- (U) Supported users and requirements organizations for MNS/ORD development.
- (U) Led Air Force participation in the Government/Industry Working Group to foster cooperation for improving EC system design and acquisition.
- (U) Supported Joint Services Organizational/Working Groups.

(U) FY 1992 Planned Program:
- (U) Continue support to EC program offices:
  -- (U) Support planning for Tactical MWS Program.
  -- (U) Support planning for ASTE Program.
  -- (U) Independent review of Manned Destructive SEAD Program.
- (U) Continue EC Test Process training.
- (U) EW Database Support, Maintenance and Growth.
- (U) Continue development of EC Test Handbooks.
- (U) Publish and Distribute EC Test Managers Handbook.
- (U) Advocate, Support and Distribute Common EC Computer Simulation Architecture.
- (U) Complete studies and analysis for:
  -- (U) SOF EC Requirements Roadmap.
  -- (U) Strategic Systems - within funding constraints.
  -- (U) Tactical Systems - within funding constraints.
  -- (U) C-17 MWS Sensor Optimization Study.

Program Element: #0604270F Budget Activity: #4 - Tactical Programs
PE Title: EW Development

-- (U) Complete HPCM Mission/Requirements Analysis.
-- (U) Update EC Planning Guide for TAC.
- (U) Continue support of joint service organizations/working groups.
- (U) Continue support of users in developing EC requirements.
- (U) Working with Wright Labs to develop forum to support EW Industry's IR&D.

(U) FY 1993 Planned Program:
- (U) Continue support to EC program offices.
- (U) EW Database Implementation, Review, and Upgrade.
- (U) Advocate and Support the J-MASS Architecture for all EC Modeling.
- (U) Studies and analysis for:
  -- (U) SOF/Airlift Defensive Systems.
  -- (U) Tactical Systems.
  -- (U) Update EC Planning Guide for TAC.
- (U) Continue support of users in developing EC requirements.
- (U) Continue with Wright Labs to support EW Industry's IR&D.

(U) Work Performed By: Project is joint Air Force Systems Command and Air Force Logistics Command with offices located at Wright-Patterson Air Force Base, OH.

(U) Related Activities:
(U) AFECO works closely with the Joint Services Organizational/Working Groups 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 this effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds: N/A

(U) International Cooperative Agreements: N/A

Program Element: #0604270F
PE Title: EW Development

Budget Activity: #4 - Tactical Programs

5. (U) Project: 3896, Advanced Strategic and Tactical Infrared Expendables (ASTE)
This program develops and fields advanced infrared (IR) expendable countermeasures (CM) for a variety of Air Force aircraft. These countermeasures will be designed to provide increased effectiveness against advanced IR guided missiles, thus providing substantial improvements in aircraft survivability. Program acquisition strategy is to execute activities to develop and field a near term capability and develop a roadmap to address a longer term capability. This is a continuing program.

(U) FY 1991 Accomplishments:
- (U) Identified IR expendable technologies to increase capability to meet operational requirements.
- (U) Initiated several design studies with NWSC Crane to examine feasibility of several expendable concepts: Kinematic type, MJU-10 size decoy flare and simple and inexpensive tethered flare.
- (U) Completed draft effort to define an overall advanced expendable development roadmap.
- (U) Award four of five DEM/VAL contracts.

(U) FY 1992 Planned Program:
- (U) Conduct ground based radiometric and ejection testing of prototype expendables.
- (U) Initiate ground based and airborne radiometric and trajectory testing of prototypes.
- (U) Prepare for FY 1993 Engineering and Manufacturing Development (EMD) solicitation.
- (U) Complete advanced expendable development roadmap.
- (U) Award last of five DEM/VAL contracts.

(U) FY 1993 Planned Program:
- (U) Conclude ground based and airborne radiometric and trajectory testing of prototypes.
- (U) Conduct airborne testing of prototype units.
- (U) Continue digital modelling, hardware in the loop testing, and analysis efforts.
- (U) Continue data reduction and effectiveness evaluation and System Requirements Document (SRD) for the EMD RFP.
- (U) Initiate source selection for EMD.
- (U) Continue efforts to digitally model selected IR seekers.
- (U) Continue development of an integrated engagement modelling system.
- (U) Complete fabrication and acceptance testing of On-Board CM test pods in early FY 1993.
- (U) Initiate modelling and analysis efforts to evaluate potential solutions.

(U) Work Performed By: Air Force Systems Command, Aeronautical Systems Division, Electronic Combat and Reconnaissance SPO, Wright Patterson AFB, OH, holds overall management responsibility program; Electronic Warfare Division, Avionics Laboratory, Wright Labs provides technical expertise. Naval Weapons Support Center, Crane, Indianappolis, IN, for advanced development of prototype designs and technical assistance/support during Technology Demonstration ground and flight testing. DEM/VAL contractors: Tracor Aerospace, Austin,TX; Thiokol Corp.,Brigham City, UT; Lockheed Sanders, Nashua, NH; Alloy Surfaces, Wilmington, DE; Loral EOS, Pasedena, CA; and Tracor, San Ramon, CA.

(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.

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

(U) International Cooperative Agreements: Not applicable.

FY1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270F
PE Title: EW Development

Project Number: 4076
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ In Thousands)

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| On Board Electronic Warfare Simulator (OBEWS) | 0 | 1,900 | 14,400 | 45,700 | 62,000 |

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 and Manufacturing Development (EMD) system will be internally mounted and work through each platform's radar warning receiver (RWR). For the F-16, 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). OBEWS mission planning and debriefing will be accomplished on the Air Force Mission Support System (AFMSS).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Planned for FY 92 request for proposal (RFP) release.

2. (U) FY 1992 Planned Program:
   - (U) Release Request for Proposal (RFP) for OBEWS EMD.
   - (U) Select source(s).
   - (U) Plan for OBEWS integration into F-16 C/D and F-15E aircraft.
   - (U) Award EMD contract with production options (Aug 92).

3. (U) FY 1993 Planned Program:
   - (U) Continue OBEWS EMD.
   - (U) Conduct Critical Design Review (CDR).
   - (U) Begin OBEWS integration into F-16 C/D aircraft.
   - (U) Plan for and begin OBEWS integration into F-15 E aircraft.
   - (U) The increase over the FY 1992 budget is because FY 1993 is the first full year of EMD contract and F-16 C/D integration efforts.

4. (U) Program to Completion:
   - (U) Complete EMD.
   - (U) Complete OBEWS integration into F-16 C/D aircraft.

Program Element: #0604270F
PE Title: EW Development

Project Number: 4076
Budget Activity: #4 - Tactical Programs

- (U) Begin and complete Development Test and Evaluation (DT&E) on F-16 C/D.
- (U) Begin and complete Initial Operational Test and Evaluation (IOT&E) on F-16 C/D.
- (U) Following a production decision, produce and field OBEWS on F-16 C/D.
- (U) Complete OBEWS integration, test, production and fielding on the F-15 E aircraft.

D. (U) Work Performed By: The program is managed by the Range Systems System Program Office, , Aeronautical Systems Division (ASD/YI) at Eglin AFB, FL. OBEWS prototype contractor was AAI, Baltimore, MD. The EMD contract, however, will be awarded competitively.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: FY 93 budget request was increased based on a revised OBEWS cost estimate.

F. (U) PROGRAM DOCUMENTATION:
(U) TAF SON 317-88, OBEWS, 26 May 89
(U) TAF SORD 317-88-I-A, On Board Electronic Warfare Simulator (OBEWS), 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 0208006F, 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):

| F-16 & F-15E Mods | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost ($ in Millions) | 0 | 0 | 0 | 46900 | 46900 |
| Quantity | | | | | |
| Aircraft Installations (Group A) | | | | 866 | 866 |
| On Board Subsystems (Group B) | | | | 302 | 302 |

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 | Sep 1992 |
| 5. (U) CDR | Sep 1993 |
| 6. (U) DT&E on F-16 C/D Complete | Jan 1995 |
| 7. (U) IOT&E on F-16 C/D Complete (including test report) | Jul 1995 |
| 8. (U) Production Decision for F-16 C/D | Jul 1995 |
| 9. (U) IOC on F-16 C/D | Apr 1996 |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Advanced Missile Warning | 0 | 13,500 | 12,160 | 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 (MWS) are inadequate and the pilot must rely on visual acquisition of the missile. This project develops and integrates missile warning system technologies for current generation tactical aircraft. Pre-Engineering and Manufacturing Development (EMD) examined potential of transitioning technologies from the Integrated Electronic Warfare System (INEWS) program. 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. Internal installation is planned for the F-16 & F-15. An Electronic Countermeasures (ECM) pod mechanization system is a candidate for F-111 and A-10 aircraft.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Validated operational requirement
   - (U) Demonstrated missile warning system effectiveness on fighter aircraft
   - (U) Completed thermal risk reduction task for F-15 and F-16 started in FY 90.
   - (U) Monitored and coordinated with Navy on integration study effort for F/A-18.

2. (U) FY 1992 Planned Program:
   - (U) ECM/Missile Warning Pod mechanization program for A-10 and F-111:
     -- (U) Study cost, schedule, risk, and performance of ECM pod modified for Missile Warning.
     -- (U) Demonstrate integration of existing MWS's into the ALQ-131 & ALQ-184 ECM pods.
     -- (U) Start flight demonstrations of modified pods.
     -- (U) Prepare Milestone II documentation.
   - (U) Internal Missile Warning program for F-15 and F-16:
     -- (U) Prepare Milestone II documentation.
     -- (U) Conduct OSD directed Joint Service effort to identify possible common applications.
     -- (U) Begin vibration and plume risk reduction tests of electro-optic sensors.

3. (U) FY 1993 Planned Program:
   - (U) ECM pod mechanization program:
     -- (U) Complete flight demonstrations
     -- (U) Make EMD (Milestone II) decision.
     -- Conduct EMD Source Selection.
     -- Award Engineering and Manufacturing Development (EMD) contract.
     -- (U) Fabricate EMD hardware for unit and system tests.

Program Element: #0604270F
PE Title: EW Development
Project Number: 4077
Budget Activity: #4 - Tactical Programs

- (U) Internal Missile Warning program:
  -- (U) Complete risk reduction testing started in FY 1993.
  -- (U) Make EMD (Milestone II) decision.
  -- (U) Conduct EMD Source Selection.
  -- (U) Award missile warning system and aircraft integration EMD contracts .

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

D. (U) Work Performed By: Air Force Systems Command, Aeronautical Systems Division, Electronic Warfare and Reconnaissance Program Office, Wright-Patterson AFB, OH. Air Force Logistics Command, Electronic Warfare Directorate, Warner-Robbins AFB, Ga. Major contractors in pre-EMD efforts are Sanders/General Electric INEWS Joint Venture Team, Nashua NH.,Loral Infrared & Imaging Systems, Lexington, MA., Raytheon Electromagnetic Systems Division, Goleta, CA., Westinghouse Electronic Systems Group, Baltimore, MD., General Dynamics Fort Worth Division, Fort Worth, TX., and McDonnell Douglas Aircraft Division, St Louis, MO. The missile warning system EMD contractor is still to be determined.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTIVE OF CHANGES

1. (U) TECHNICAL CHANGES: MWS demonstrations conducted by the Air Force Air Warfare Center have successfully demonstrated the ability of existing technology to detect approaching missiles. ECM pod demonstrations will now focus on pod integration risk reduction.
2. (U) SCHEDULE CHANGES: Activities leading to an EMD contract award for the internal configuration have been delayed for two reasons. There were delays in coordinating the Operational Requirements Document. This resulted in a 6 month slip in schedule. Also, the Under Secretary of Defense for Acquisition has delayed the award of an internal system EMD contract award until potential joint program opportunities have been addressed. The Air Force is expecting tasking to lead a Joint Service effort to resolve potential joint technical solutions. This effort is expected to delay contract award an additional 6 months. The budget request has already been adjusted to reflect these schedule changes.
3. (U) COST CHANGES: The delay in awarding the internal system EMD contract has resulted in a reduced FY 93 budget estimate and additional costs in the outyears.

F. (U) PROGRAM DOCUMENTATION:
(U) TAF SON 316-88, Missile Warning System, 6 Sep 89 (S).
(U) TAF SORD 316-88-I-A, Missle Warning System on Existing TAF Aircraft, 5 Nov 91 (S/NF).

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.

Program Element: #0604270F
PE Title: EW Development

Project Number: 4077
Budget Activity: #4 - Tactical Programs

J. (U) MILESTONE SCHEDULE:

| | |
|---|---|
| 1. (U) Complete flight demonstrations of ECM pods | Apr 1993 |
| 2. (U) EMD decision (Milestone II) for ECM pod | Feb 1993 |
| 3. (U) EMD decision (Milestone II) for internal system | Mar 1993 |
| 4. (U) EMD contract award for ECM pod | Aug 1993 |
| 5. (U) EMD contract award for internal installation | Aug 1993 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604270F
PE Title: EW Development
Project Number: 5618
Budget Activity: # 4 - Tactical Programs

A. (U) RESOURCES ($ In Thousands)
Project Title: F-15 Protective Systems

| Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| TEWS | 20,506 | 25,944 | 19,240 | 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 1991 Accomplishments:
   - (U) ALQ-135 Band 3, Phase I OT&E flight test complete - Nov 90.
   - (U) Fielded emergency software changes required in ICS, RWR, and CMD to support Desert Shield/Storm.
   - (U) Integration Phase II testing continued, anechoic chamber, CT&E, DT&E.
   - (U) ALQ-135 Lot IV system deliveries began.
   - (U) Demonstrated ALQ-135 Phase II capability against Compass Glory threats.
   - (U) System combat proven in Desert Storm
   - (U) Released auto/semi-auto and flare inhibit CMD capabilities to TAC for fielding
   - (U) Demonstrated ALR-56C/ALQ-135 effectiveness during HAVE LOAN testing
   - (U) 66 of 81 ALQ-135 Band 3 systems installed at Seymour Johnson AFB

2. (U) FY 1992 Planned Program:
   - (U) Continue development testing to support TEWS Integration and Radio Frequency Compatibility Programs.
   - (U) Conduct TEWS Threat Studies.
   - (U) Complete F-15E ALR-56C/ALQ-135 Phase II developmental testing.
   - (U) ALR-56C complete development of Preflight Message Generator.
   - (U) Begin refurbishment of ALR-56C and ALQ-135 test assets for return to operational inventory.
   - (U) Complete ALR-56C software threat updates, especially APG-70 type radars.
   - (U) Start F-15E ALR-56C/ALQ-135 Phase II Operational testing.

3. (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) Complete F-15E OT&E of TEWS phase II full specification system and install.
   - (U) Continue ALR-56C software threat updates, especially APG-70 type radars.

Program Element: #0604270F
PE Title: EW Development
Project Number: 5618
Budget Activity: #4 - Tactical Programs

- (U) Start F-15C TEWS Phase II OT&E.

4. (U) Program to Completion:
   - (U) Improve integration of TEWS with aircraft avionics and fire control radar.
   - (U) Complete TEWS displays improvements.
   - (U) Accomplish integrated TEWS software update and testing.
   - (U) Complete F-15C Phase II OT&E.
   - (U) Continue ALR-56C threat updates

D. (U) Work Performed By: Air Force Systems Command, Aeronautical Systems Division, 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 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: F-15E TEWS Phase II test complete date slipped to third quarter FY 93 to accomodate expanded test requirements directed by DOT&E.
3. (U) COST CHANGES: FY93 request lowered due to revised cost estimate.

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, Dual Role Fighter, Nov 84.
   (U) F-15E TEMP, Nov 87 (TEWS Annex complete).
   (U) TAF SON 304-80, Tactical Self-Protection Electronic Warfare Systems, 15 Jun 81.
   (U) ALQ-135 SORD, Jul 90

G. (U) RELATED ACTIVITIES:
   (U) F-15E aircraft is developed and produced in PE 0207134F. F-15C 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) Aircraft Procurement

| ACFT Procurement PE 0207130F, 0207134F | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| ALR-56C Funds | 12,542 | 38,000 | 46,300 | 28,900 | 350,800 |
| ALR-56C Qnty | 8 | 32 | 37 | 37 | 558 |
| ALQ-135 Funds | 0 | 139,600 | 152,400 | 333,000 | 1,088,300 |
| ALQ-135 Qnty | 0 | 60 | 60 | 165 | 496 |

I. (U) International Cooperative Agreements: Not Applicable

J. (U) MILESTONE SCHEDULE:
   1. (U) ALQ-135 Phase I Developmental Testing complete May 1990

Program Element: # 0604270F
PE Title: EW Development
Project Number: 5618
Budget Activity: # 4 - Tactical Programs

| | | |
|---|---|---|
| 2. | (U) F-15E Early Operational Assessment complete | Nov 1990 |
| 3. | (U) ALQ-135 Phase II Integration Testing | Feb 1991 |
| 4. | (U) ALQ-135 Phase II Developmental Flight Testing | Nov 1991 |
| 5. | (U) ALQ-135 Phase II Operational Testing starts | Sep 1992 |
| 6. | (U) ALR-56C/ALQ-135 integrated baseline (OT&E Certification) | Oct 1993 |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Peacekeeper in Minuteman Silo | 7,463 | 2,906 | 1,000 | 1,000 | N/A |
| Peacekeeper Rail Garrison | 357,215 | 10,036* | 0 | 0 | N/A |
| Advanced Guidance Program | 0 | 15,000 | 53,913 | N/A | N/A |
| Small ICBM | 217,192 | 154,519 | 0 | 0 | 3,686,550 |
| Total | 581,870 | 182,461 | 54,913 | 1,000 | TBD |

* Authorized under FY 92 Continuing Resolution, spent from PE 0604312F (SICBM) (Reference Principles of Federal Appropriation Law, pg 7-11).

B. (U) BRIEF DESCRIPTION OF ELEMENT: ICBM modernization was required to support U.S. strategic deterrent policy while responding to changes in the projected nuclear threat and target base. The near-term response -- fifty Peacekeepers in Minuteman silos along with the existing Minuteman force -- could deter a broad spectrum of potential threats, including massive conventional or limited nuclear attacks on the United States or our allies. The long-term response protected the option to deploy Small ICBM which offered contemporary technology, long life, and the capability for highly survivable mobile basing should world conditions ever warrant. The three missiles would have possessed capabilities, which could greatly reduce the likelihood of an attack, thus enhancing deterrence and prospects for peaceful solutions. Further, the program would have greatly strengthened our START negotiating position and the quality of US post-START forces. The Peacekeeper Rail Garrison and Small ICBM have been terminated. Air Force plans to begin moving all START related funding into PE 0305145F, Arms Control Compliance this year.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH 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 1991 Accomplishments:
- (U) Continued SELP and OT programs.
- (U) Continued SFIR improvement effort.
- (U) Completed missile production.

(U) FY 1992 Planned Program:
- (U) Continue SELP and OT programs.
- (U) Continue SFIR improvement effort.

(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).

Program Element: # 0604312F Budget Activity: #3 - Strategic Programs
PE Title: ICBM Modernization

(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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | TBD | TBD | 0 | 0 | TBD |
| Quantity | 0 | 0 | 0 | 0 | 102 |

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604312F
P. 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 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| Major Contract | 226,603 | 810 | 0 | N/A |
| Support Contract | 75,086 | 7,635 | 0 | N/A |
| In-House Support | 11,994 | 426 | 0 | N/A |
| GFE/ Other | 43,532 | 1,165 | 0 | N/A |
| Total | 357,215* | 10,036** | 0 | N/A |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | To Complete |
| Program Milestones | PMD - 3/91 | N/A | N/A | N/A |
| Engineering Milestones | CDR 1/91 - 3/92 | N/A | N/A | N/A |
| T&E Milestones | CALTP II - 10/90<br>CALTP III - 9/91 | N/A | N/A | N/A |
| Contract Milestones | | TERMINATED | | |

* Peacekeeper Rail Garrison amount does not include $114.532M in OSD/AF withholds and therefore, unavailable for use by the SPO. Total FY 91 funding includes all known/identified termination efforts, except $15.085M associated with terminating the Rockwell/LCS contract.

** Authorized under FY 92 Continuing Resolution.

Program Element: # 0604312F Project Number: N/A
PE Title: ICBM Modernization 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 Garrison, should future threat necessitate its deployment. President Bush terminated the program on 27 Sep 1991.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Completed prime item development specification.
   - (U) Conducted EM demonstrations at the DIL.
   - (U) Completed Rail Car/Train dynamics testing.
   - (U) Completed CALTP III.
   - (U) Completed Guidance & Control (G&C) Software Test Readiness Review.
   - (U) Completed MLC/LCC integration.
   - (U) Continued CDRs.
   - (U) Completed Interface Control Drawings.
   - (U) Received first MLC OM (Pathfinder OM-4).
   - (U) Began Functional Configuration Audits (FCAs).
   - (U) Conducted mobility testing.
   - (U) Conducted Operational Model (OM) demonstration at the DIL.
   - (U) Received first Basing Verification Missile (BVM) and Aerospace Vehicle Equipment (AVE) hardware.
   - (U) Baselined the Logistics Support Analysis (LSA) Review.

2. (U) FY 1992 Planned Program:
   - (U) Initiate and complete termination of the Peacekeeper Rail Garrison program.
   - (U) Document the existing design.
   - (U) Plan and execute the disposition of train hardware and facilities at Vandenberg AFB, CA.

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

4. (U) Program to Completion: Not Applicable.

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 1992 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Not Applicable.

2. (U) SCHEDULE CHANGES: The President terminated the program on 27 Sep 1991.

3. (U) COST CHANGES: Anticipated termination costs are shown in Part A.

Program Element: # 0604312F
PE Title: ICBM Modernization
Project Number: N/A
Budget Activity: #3 - Strategic Programs

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.
- (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 | 06/89 - 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 timeliness |
| CALTP Phase II | 07/90, 10/90 | Results within program requirements |

Program Element: # 0604312F
PE Title: ICBM Modernization
Project Number: N/A
Budget Activity: #3 - Strategic Programs

| | | |
|---|---|---|
| SYSTEM INTEGRATION | | |
| Canister/Missile/MLC Integration | 07/90 | Results within program requirements |
| Train Integration | 12/90 | Results within program requirements |
| Rail Car/Train Dynamics | 03/91 | Results within program requirements |
| CALTP Phase III | 09/91 | Results within program requirements |

T&E ACTIVITY (TO COMPLETION)

| Event | Planned Date | Results |
|---|---|---|

The President terminated the program on 27 Sep 1991.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604312F
PE Title: ICBM Modernization
Project Number: N/A
Budget Activity: #3 - Strategic Programs

Project Title: Advanced Guidance Program

POPULAR NAME: Advanced Guidance Program

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

| BUDGET ($000) | FY 1991 | FY 1992* | FY 1993* | To Complete |
|---|---|---|---|---|
| Major Contract | N/A | 0 | 33,000 | N/A |
| Support Contract | N/A | 11,000 | 9,918 | N/A |
| In-House Support | N/A | 4,000 | 8,000 | N/A |
| GFE/ Other | N/A | 0 | 3,000 | N/A |
| Total | N/A | 15,000 | 53,918 | N/A |
| SCHEDULE | FY 1991 | FY 1992* | FY 1993* | To Complete |
| Program Milestones | N/A | N/A | N/A | N/A |
| Engineering Milestones | N/A | N/A | N/A | N/A |
| T&E Milestones | N/A | N/A | N/A | N/A |
| Contract Milestones | N/A | N/A | N/A | N/A |

* OSD directed Air Force to expand an effort to improve the Minuteman III guidance system. This action was initiated in conjunction with the Presidential direction to terminate the Small ICBM and anticipated decision to remove the Peacekeeper missile from alert status. This portion of the FY92 and FY93 funding was improperly placed in PE 0604312F (ICBM Modernization). The balance of the program (FY94 and beyond) will be funded and managed through PE 0101213F (Minuteman Squadrons).

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 Minuteman guidance set requires replacement due to the degradation similar to that previously exhibited in the Minuteman II guidance set. This program replaces/upgrades the guidance unit (NS-20) in a phased approach over the next decade. The first phase will start with contract award in FY93 and will design new guidance system electronics external to the inertial measurement platform that will be compatible with both the existing inertial measurement platform and an Advanced Inertial platform. The second phase, which begins in FY95, will develop the Advanced Inertial platform and integrate the system electronics for use in Minuteman III.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments: N/A

2. (U) FY 1992 Planned Program:
   - (U) Begin common parts studies/development work on radiation hardened parts.
   - (U) Continue reliability improvements to inertial instruments.
   - (U) Begin specification development.
   - (U) Define guidance and control interfaces.
   - (U) Prepare EMD Request for Proposal.

3. (U) FY 1993 Planned Program:
   - (U) Award EMD contract(s).
   - (U) Begin hardware and software developments.
   - (U) Begin Developmental Test and Evaluation.
   - (U) Continue common parts studies/development work on radiation hardened parts.

4. (U) Program to Completion:
   - (U) Evaluate results of Advanced Technology Transition Demonstration (ATTD) of the Advanced Inertial Measurement System (AIMS).
   - (U) FY95 contract award for integration of system electronics and AIMS EMD.
   - (U) Program effort will be transferred to PE 0101213F (Minuteman Squadrons) beginning in FY94.

D. (U) WORK PERFORMED BY: The program is managed by the Silo-Based ICBM System Program Office at Ogden ALC, Hill Air Force Base, UT. Pre-EMD contractors for guidance systems electronics include Rockwell International (Autonetics), Anaheim, CA and Charles Stark Draper Laboratory (CSDL), Cambridge, MA. Facilities at Hill AFB, Sandia Labs and Kirtland AFB will be used for nuclear hardness testing. The EMD contractor(s) will be selected through full and open competition.

E. (U) COMPARISON WITH FY 1991 DESCRIPTIVE SUMMARY:
1. (U) TECHNICAL CHANGES: N/A
2. (U) SCHEDULE CHANGES: N/A
3. (U) COST CHANGES: N/A

F. (U) PROGRAM DOCUMENTATION:
- (U) AFLC SON 001-90, Improved Reliability/Maintainability Advance Guidance System for ICBMs, 15 Apr 91
- (U) SAC MNS 001-92-1 (Draft), Prompt Strategic Strike Capability.
- (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)

Program Element: # 0604312F
PE Title: ICBM Modernization
Project Number: N/A
Budget Activity: #3 - Strategic Programs

G. (U) RELATED ACTIVITIES:
(U) Program element 0603311F, Ballistic Missile Technology.

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 |
|---|---|---|
| None, program is a new start | | |

FY 1993 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 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| Major Contract | 159,853 | 86,270 | 0 | N/A |
| Support Contract | 40,426 | 9,200 | 0 | N/A |
| In-House Support | 3,424 | 2,200 | 0 | N/A |
| GFE, Other | 13,489 | 1,830 | 0 | N/A |
| Total | 217,192 | 154,519* | 0 | N/A |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | To Complete |
| Program Milestones | N/A | N/A | N/A | N/A |
| Engineering Milestones | N/A | N/A | N/A | N/A |
| T&E Milestones | FTM-2 3Q/FY91 | N/A | N/A | N/A |
| Contract Milestones | RESTART CONTRACTS IN PLACE | MOBILITY TERMINATED - TOTAL PROGRAM TERMINATED | N/A | N/A |

* FY92 Appropriations Act provided a total of $433.8M (all RDT&E) for the Small ICBM program. OSD authorized $164.6M to complete termination of the Small ICBM program, however, due to support of Rail Garrison CRA, actual amount available is $154.5M. Current Air Force termination guidance allows only $99.5M in FY92 spending (amount previously obligated under CRA).

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 was required to support United States' efforts to defend itself against both traditional and potential enemies. The mission was to support U.S. strategic deterrent policy while responding to changes in world conditions through a mobile, flexible, highly survivable ICBM, which would enhance strategic stability, deterrence, and arms control. On 27 Sep 91, the President cancelled the mobile portion of the Small ICBM program and the FY 93 Amended President's Budget continued Small ICBM in a silo basing mode. On 28 Jan 92, the President cancelled the entire Small ICBM program.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Continued missile development. Fabricated flight test hardware/spares.
   - (U) Conducted northern tier hard mobile launcher mobility testing
   - (U) Conducted FTM-2 flight test.
   - (U) Developed basing-missile interfaces common to mobile and silo basing.
   - (U) Issued basing restart supplemental agreements for FSD program.

2. (U) FY 1992 Planned Program:
   - (U) Cancelled HML basing FSD.
   - (U) Terminated entire Small ICBM program.

3. (U) FY 1993 Planned Program: N/A

4. (U) Program to Completion: N/A

D. (U) WORK PERFORMED BY: The program was managed by the Ballistic Missile Organization, Norton Air Force Base, CA. Facilities at Arnold Engineering Development Center, Tullahoma, TN, were used for motor testing and facilities at the Central Inertial Guidance Test Facility at Holloman AFB, NM, were used for guidance testing. The Small ICBM program also utilized 22 labs and agencies throughout the U.S. to conduct testing and analyses. Flight testing was conducted at Vandenberg AFB, CA. The associate contractors (ASCONs) were 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 - contract cancelled in 1st quarter FY92); 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 began due to the 27 Sep 91 Presidential decision to base the missile in existing silos rather than the Hard Mobile Launcher. The entire program was subsequently terminated on 28 Jan 92.
2. (U) SCHEDULE CHANGES: The program will accomplish termination actions in FY92.
3. (U) COST CHANGES: OSD provided $164.6M in FY92 funding to accomplish the Small ICBM program termination. Air Force termination guidance authorized $99.5M in FY92 (amount authorized under CRA) and no more until further notice.

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)

Program Element: # 0604312F
PE Title: ICBM Modernization
Project Number: N/A
Budget Activity: #3 - Strategic Programs

- (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).

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 #2 Guidance | Sep 87 | Flight tests of AINS guidance. Flight Tests systems to evaluate relative performance in a flight environment. |
| Canister Assembly and Launcher Test Program (CALPT) | Oct 87<br>Dec 87<br>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<br>Jul-Sep 88<br>Nov88-Apr 89 | Collect data, determine parameters and confirm performance of Meteor Burst Communications. |
| Northern Tier Mobility Test | Dec 87-Mar 88<br>Jun-Aug 91 | 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 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. |

Program Element: # 0604312F
PE Title: ICBM Modernization

Project Number: N/A
Budget Activity: #3 - Strategic Programs

| | | |
|---|---|---|
| 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 Test (PSRA)/Stage III Model Survey Test | May 88 | Characterize undamped natural frequencies, and Small ICBM PSRA/Stage III. |
| Instrumentation and Range Safety System (IRSS) Qualification Testing | Feb 88-Feb 89 | Evaluate performance adequacy of 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<br>Aug-Nov 91 | HML antenna pattern determination. |
| FTM-2 | April 91 | 100% successful. Stage II nozzle cone performed to specs. |
| Program terminated | 31 Jan 92 | |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604321F Budget Activity: #4 - Tactical Programs
PE Title: Tactical Fusion Program

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| XXX1 | Tactical Fusion Program (formerly JTFP) | | | | |
| | 4,972 | 4,957 | 3,100 | 500 | 132,746 |

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Joint Tactical Fusion Program 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 in CONUS, USAFE, and PACAF 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 TAC, USAFE and PACAF.

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

1. (U) PROJECT XXX1,Tactical Fusion Program:

(U) FY 1991 Accomplishments:
- (U) Began development of Phase I implementation CTAPS TAFLC, including correlation processor, message handler, and database software modifications to open system standards.

(U) FY 1992 Planned Program:
- (U) Complete Phase I CTAPS implementation and software development.
- (U) Begin implementation of TAC, USAFE, and PACAF SCI-level correlation effort in conjunction with Intelligence Data Handling Systems (IDHS) developments.

(U) FY 1993 Planned Program:
- (U) Integrate system with IDHS upgrades, including collection management, imagery, common mapping system, and battle damage assessment capabilities.
- (U) Finish implementing SCI-level correlation effort.
- (U) Complete Phase II of TAFLC integration into CTAPS.

(U) Work Performed By: All tasks are managed by Electronic Systems Division, Hanscom AFB MA. Contractors include: BTG

Program Element: #0604321F Budget Activity: 4 - Tactical Programs
PE Title: Tactical Fusion Program

Corporation, Vienna, VA, PRC Corporation, Omaha, NB, and IDI Inc., Wakefield MA.

(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: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604327F
PE Title: Hardened Target Munitions
Budget Activity: #4 - Tactical Programs

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3273, I-2000 $P^3I$ | 0 | 7,136 | 5,700 | 0 | 12,760 |
| 3311, Boosted Penetrator | 0 | 5,913 | 0 | TBD | TBD |
| Total | 0 | 13,049 | 5,700 | TBD | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program develops munitions capable of destroying various classes of hardened targets, from lightly hardened to extremely hardened and buried, as required by TAP SON 305-85, Hardened Target Munitions, 14 Oct 86. Desert Storm intensified the need for such weapons. The Improved 2000 (I-2000) pound penetrator warhead (BLU-109/B) satisfies the requirement for medium hard vertical targets. Under Project 3273, the I-2000 warhead will be integrated with the AGM-130 missile (designated AGM-130C) for a precision guided, standoff capability against both vertical and horizontal medium hardened targets. The AGM-130C provides the ability to attack from outside target point defenses, and therefore greatly reduce aircraft attrition. Earlier under Project 3273, the I-2000 was integrated with the GBU-15 glide bomb for use against vertical targets, with IOT&E and SEEK EAGLE testing completed in 1991. GBU-15/I-2000 integration kits are now being procured and delivered. Approximately $6.0 million of the FY 1992 funding will be used to examine and evaluate approaches to defeat the deeply buried and massively reinforced hardened targets. For the near to mid-term, we will look at improvements to the rapidly assembled GBU-28 penetrator weapon used in the latter stages of Desert Storm, and compare the reasonableness and effectiveness of those GBU-28 improvements to other weapon options. For the longer term, we will conduct an in-depth concept definition study of the Boosted Penetrator to better guide the current laboratory advanced development program and facilitate a transition to Engineering and Manufacturing Development (E&MD) as early as FY 1995. The Boosted Penetrator will be capable of destroying targets well beyond the capability and ranges of current conventional munitions. The study results will be implemented in FY 1994 under Project 3311. A portion of the $6 million will be used for rapid prototyping of an intelligent fuze for hardened target munitions, the fuze being the "tall pole" in GBU-28 needed improvements.

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

1. (U) Project 3273, I-2000 P3I: TAF SON 305-85 specified the need for munitions capable of destroying buried and hardened targets--from lightly to medium to heavily hardened, both horizontal and vertical. Under this project the I-2000 will be integrated with the AGM-130 (to be designated the AGM-130C) for a standoff capability against vertical and horizontal medium hardened targets. The I-2000 was earlier integrated with the GBU-15 under this project for medium hardened vertical targets.

Program Element: #0604327F Budget Activity: #4 - Tactical Programs
PE Title: Hardened Target Munitions

(U) FY 1991 Accomplishments:
- (U) Complete IOT&E and SEEK EAGLE testing of the GBU-15/I-2000.

(U) FY 1992 Planned Program:
- (U) Begin AGM-130C E&MD, integrating the AGM-130 and I-2000 warhead.
- (U) Assess capability of AGM-130C against horizontal target surfaces.
- (U) Begin AGM-130C and F-15E integration.

(U) FY 1993 Planned Program:
- (U) Complete AGM-130C E&MD.
- (U) Conduct AGM-130C DT&E/IOT&E.
- (U) Continue assessment of the AGM-130C capability to attack horizontal targets.

(U) Work Performed By: The Aeronautical Systems Division at Eglin AFB, FL, manages this program. Rockwell International, Duluth, GA, is the contractor for the development of the AGM-130/I-2000 integration.

(U) Related Activities:
(U) Program Element #0604602F, Armament/Ordnance Development.
(U) Program Element #0604733F, Surface Defense Suppression.
(U) Program Element #0603601F, Conventional Munition Development.
(U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

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

(U) Procurement:

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| - (U) Other Procurement PE 0208030F (BA 61, P-1 Line Item TBD) | | | | | |
| Cost | 2,886 | 0 | 0 | 0 | 3,286 |
| GBU-15/I-2000 Integration Kit Qty | 1,570 | 0 | 0 | 0 | 1,620 |
| - (U) Other Procurement PE 0207165F (BA 61, P-1 Line Item TBD) | | | | | |
| Cost | 0 | 0 | 0 | 2,292 | 2,292 |
| AGM-130/I-2000 Integration Kit Qty | 0 | 0 | 0 | 1,319 | 1,319 |

(U) Military Construction: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3311,Boosted Penetrator: This project funds the development of a Boosted Penetrator for buried and massively reinforced targets. This precision guided, unitary hardened target warhead, is configured for internal carriage and external carriage on a variety of current and planned aircraft. This munition will be capable of destroying structures well beyond capabilities of current weapons. We will use the $6 million added by Congress in FY 92 to look at ways to facilitate E&MD entry for the Boosted Penetrator, evaluate effective improvements to the GBU-28 (and other alternatives for the near term), and work on an intelligent fuze for hardened target munitions.

Program Element: #0604327F
PE Title: Hardened Target Munitions

Budget Activity: #4 - Tactical Programs

(U) FY 1991 Accomplishments: Not Applicable.

(U) FY 1992 Planned Program:
- (U) Study and evaluate improvements to the GBU-28, in warheads, fuzes, guidance, and penetration capabilities in relation to representative targets.
- (U) Conduct expanded concept definition of Boosted Penetrator, including aircraft integration analysis to aid in sizing.
- (U) Begin qualification testing and assessment of a reliable intelligent fuze for use on hardened target munitions.
- (U) Begin initial planning activities for FY 94 start of development efforts on Boosted Penetrator for the long term and/or GBU-28 improvements (or other alternatives) for the near to mid-term.

(U) FY 1993 Planned Program: Not Applicable.

(U) Work Performed By: The Aeronautical Systems Division, Eglin AFB, FL, manages this program. Contractor for the AGM-130C development is Rockwell International, Duluth, GA, and for the Boosted Penetrator is TBD.

(U) Related Activities:
- (U) Program Element #0604602F, Armament/Ordnance Development.
- (U) Program Element #0604733F, Surface Defense Suppression.
- (U) Program Element #0603601F, Conventional Munition 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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604408F
PE Title: National Launch System

Project Number: 0001
Budget Activity: #6 - Defense Wide Mission Support

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

| Project Title / Popular Name | FY 1991 Estimate | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| National Launch System* | 24,772 | 54,383 | 125,000 | Cont | TBD |

* (formally the Advanced Launch System)

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

National Space Policy Directive - 4 states that the National Space Launch Strategy is composed of four elements. One of the four elements is the development of a new, unmanned, but man-rateable, space launch system to greatly improve national launch capability with reductions in operating costs and improvements in launch system reliability, responsiveness, and mission performance. DoD space policy directs pursuit of launch concepts aimed at substantially reducing costs while improving responsiveness, capability, reliability, availability, maintainability, flexibility, and operability in peace, crisis, and war. Current launch vehicles do not meet the above requirements. Therefore, the Air Force has joined with the National Aeronautics and Space Administration (NASA) to pursue the joint development of the National Launch System (NLS) family of vehicles and their attendant infrastructure with a goal of first launch in the year 2002. The family of vehicles consists of three vehicles with the planned payload capacities to low earth orbit as follows: NLS-1 = 135,000 pounds; NLS-2 = 50,000 pounds; and NLS-3 = 20,000 pounds. The NLS program, in addition to supporting the National and Civil needs, may also support commercial launch needs. The Advanced Development Program (ADP) is the portion of NLS that focuses on the pacesetting technologies required to field this new system. Funding for the development program will be equally shared between the Air Force and NASA on an annual 50/50 cost share arrangement

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Completed and demonstrated propulsion technologies such as:
     -- (U) Demonstrated subscale nozzle cooling tube bulge forming process
     -- (U) Demonstrated cast titanium alloy hydrogen turbopump impeller
     -- (U) Completed propellant electromechanical actuator and control valve engineering model tests
     -- (U) Completed 40,000 pound thrust subscale injector test firing
   - (U) Completed and demonstrated numerous system design technologies such as:
     -- (U) Demonstrated multi-path redundant avionics architecture
     -- (U) Preliminarily demonstrated LIDAR wind profiler for adaptive guidance and navigation
     -- (U) Demonstrated software for load cycle simplification
     -- (U) Demonstrated remote cable identification

2. (U) FY 1992 Planned Program:
   - (U) Two thirds of the effort will be on propulsion technologies and the critical path development for NLS, the Space Transportation Main Engine (STME) as follows:
     -- (U) Develop turbopumps, thrust control assemblies, gas generators, controller and sequencer, dumped cooled nozzle, etc.
     -- (U) Modify Stennis Space Center (MS) existing turbomachinery test stand to allow testing of STME components (i.e. turbopumps, etc.).
     -- (U) Modify Air Force Phillips Laboratory (Edwards Air Force Base, CA) existing facilities to test engine components (i.e. thrust chamber, etc.).
     -- (U) Modify and design test facilities at Marshall Space Flight Center for engine components (i.e. gas generators, injectors, etc.).

Program Element: #0604408F
PE Title: National Launch System
Project: Number: 0001
Budget Activity: #6 - Defense Wide Mission Support

-- (U) Preparations for and award of a full scale development contract for the STME
- (U) Continue work on system design technologies such as: adaptive guidance, navigation and control; aluminum lithium and advanced processes; low cost thermal protection system; advanced cryo tanks; etc.

3. (U) FY 1993 Planned Program:
   - (U) Increase work on the STME, hardware tests as well as engineering designs, leading to a preliminary design review
   - (U) Award contracts for vehicle design and begin the effort leading to a preliminary design review in fiscal year 1994
   - (U) Increase work on system technologies required for full scale development
   - (U) Increase preparation work for infrastructure projects, such as environmental impact analyses, preliminary designs, etc., which will begin in fiscal year 1994

4. (U) Program to Completion
   - (U) This is a continuing program
   - (U) First test firing of the STME in fiscal year 1996
   - (U) First launch in fiscal year 2002 of the 50,000 and 135,000 pound payload class (NLS 2 & 1) vehicles
   - (U) First launch in fiscal year 2004 of the 20,000 pound payload class (NLS-3) vehicle

D. (U) Work Performed By: The responsible Air Force agency is Air Force Systems Command's Space Systems Division, Los Angeles AFB, CA. The program office is a joint DoD/NASA program office (JPO), headed by an Air Force program director with a NASA deputy. Systems engineering is provided by the Aerospace Corporation, El Segundo, CA. Systems contractors that previously supported the Advanced Launch System program include: Boeing Aerospace, Seattle, WA; General Dynamics, Space Systems Division, San Diego, CA; and Martin Marietta Astronautics Group, Denver, CO. Systems contractors that previously supported the NASA Shuttle-C program include: Martin Marietta Manned Space Systems, New Orleans, LA; Rockwell International Corporation, Downey, CA; and United Space Boosters Incorporated, Huntsville, AL. The propulsion contractors have formed the Space Transportation Propulsion Team and include: Aerojet TechSystems Company, Sacramento, CA; Pratt & Whitney, West Palm Beach, FL; and Rocketdyne Division, Rockwell International Corporation, Canoga Park, CA.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: An evolutionary concept has been adopted for the program. Previous efforts (ALS & Shuttle-C) were too costly. NLS makes use of existing infrastructure during the initial development, such as the External Tank Facility at Michoud, LA.
2. (U) SCHEDULE CHANGES: The first launch has been rescheduled for 2002.
3. (U) COST CHANGES: Fiscal year 1993 funding was reduced when the National Launch System budget was restructured for a first launch in 2002 versus 1999.

F. (U) PROGRAM DOCUMENTATION:
- (U) National Space Policy Directive - 4, 1991
- (U) AFSPACECOM SORD 005-88-1 for a Military ALS, dated 14 August 1990
- (U) AFSPACECOM SON 005-88 for an Advanced Launch System, dated 12 August 1988
- (U) Mission Need Statement (MNS) for an Advanced Launch System, dated 30 June 1988

G. (U) RELATED ACTIVITIES:
- (U) Program funding from other source: NASA
- (U) Other expendable launch vehicle programs benefit from technology developments
- (U) There is no unnecessary duplication of this effort within the Air Force, Department of Defense, or National Aeronautics and Space Administration.

Program Element: #0604408F
PE Title: National Launch System

Project: Number: 0001
Budget Activity: #6 - Defense Wide Mission Support

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

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

J. (U) MILESTONE SCHEDULE:

| | | |
|---|---|---|
| 1. | (U) STME Preliminary Design Review | 1992 |
| 2. | (U) STME Critical Design Review | 1994 |
| 3. | (U) NLS Preliminary Design Review | 1995 |
| 4. | (U) First STME firing | 1996 |
| 5. | (U) NLS Critical Design Review | 1997 |
| 6. | (U) Start NLS Manufacturing | 1999 |
| 7. | (U) First Launch of Initial Configurations | 2002 |
| 8. | (U) First Launch of NLS-3 | 2004 |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3321 Chemical and Biological Agent Detection and Warning | 0 | 1,410 | 3,400 | Cont | TBD |
| 3337 Individual Protection | 7,339 | 9,012 | 11,800 | Cont | TBD |
| 3762 Collective Protection | 300 | 2,195 | 0 | Cont | TBD |
| 3764 Decontamination | 0 | 0 | 0 | Cont | TBD |
| Total | 7,639 | 12,617 | 15,200 | 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 FY 1993:

1. (U) Project 3321, Detection and Warning: Develops detectors to warn personnel of chemical attack.

(U) FY 1991 Accomplishments: Not Applicable.

(U) FY 1992 Planned Program:
- (U) Initiate threat-based concept studies for Radiological and Biological Detector, Individual Vapor Detector, and M8A1 detector improvement.

(U) FY 1993 Planned Program:
- (U) Continue threat-based concept studies for Radiological and Biological Detector.
- (U) Award Engineering and Manufacturing Development contract for Individual Vapor Detector and M8A1 detector improvement.

(U) Work Performed By: In-House development organizations responsible for elements of the program are the Human Systems Division, Brooks AFB TX, and the Armstrong Laboratory, Brooks AFB TX and Wright-Patterson AFB, OH.

(U) Related Activities:
- (U) Program Element #0207593F, Chemical Biological Defense Program.
- (U) Program Element #0602202F, Human Systems Technology.
- (U) Program Element #0603231F, Crew Systems Technology.

Program Element: #0604601F Budget Activity: #4 - Tactical Programs
PE Title: Chemical/Biological Defense Equipment

(U) Related Activities:
- (U) Program Element #0207593F, Chemical Biological Defense Program.
- (U) Program Element #0602202F, Human Systems Technology.
- (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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| CAM | 7,697 | 0 | 0 | 0 | 7,697 |

(U) International Cooperative Agreements: Not applicable.

2. (U) Project 3762, Collective Protection: Develops collective protection system to allow personnel to perform duties requiring a short sleeves environment, and to seek rest and relief in an uncontaminated environment.

(U) FY 1991 Accomplishments:
- (U) Completed Initial Operational Test and Evaluation (OT&E) of Transportable Collective Protection System (TCPS).

(U) FY 1992 Planned Program:
- (U) Complete Follow-on OT&E of TCPS and award production contract.

(U) FY 1993 Planned Program: Not Applicable.

(U) Work Performed By: Work for TCPS is performed by ILC Dover, Frederica, DL. In-House development organizations are Human Systems Division, Brooks AFB TX, and Aeronautical Systems Division, Wright-Patterson AFB OH.

(U) Related Activities:
- (U) Program Element #0207593F, Chemical Biological Defense Program.
- (U) Program Element #0602202F, Human Systems Technology.
- (U) Program Element #0603231F, Crew Systems Technology.
- (U) Program Element #0604617F, Air Base Operability

Program Element: #0604601F Budget Activity: #4 - Tactical Programs
PE Title: Chemical/Biological Defense Equipment

- (U) Program Element #0604703F, Aeromedical Chemical Defense System Development.
- (U) Program Element #0603806A, Chemical/BiologicalDefense 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| TCPS | 138 | 15,005 | 8,862 | Cont | TBD |

(U) International Cooperative Agreements: Not applicable.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3337 Individual Protection | 7,339 | 9,012 | 11,800 | 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 1991 Accomplishments:
   - (U) Initiated Development Test and Evaluation (DT&E)/Operational Test and Evaluation (OT&E) of the Aircrew/Eye Respiratory Protection (AERP) system for the AC-130, MH-53, B-1B, and B-52.
   - (U) Completed DT&E/OT&E on AERP for the F-16, C-9A, C-130, AC-130, MH-53, and B-52.
   - (U) Began Passive Anti-Drown Device development for AERP.
   - (U) Transferred program management responsibility of AERP to San Antonio Air Logistics Center.

3. (U) FY 1992 Planned Program:
   - (U) Complete AERP DT&E/OT&E for the B-1B.
   - (U) Complete Passive Anti-Drown Device development for AERP.
   - (U) Conduct concept study and materials/configuration review for the Groundcrew Ensemble (G/C Ens).
   - (U) Award Engineering and Manufacturing Development (EMD) contract for Disposable Eye/Respiratory Protection (DERP)

4. (U) FY 1993 Planned Program:
   - (U) Develop E-3 Class V modification design for AERP.
   - (U) Complete Passive Anti-Drown Device development for AERP.
   - (U) Award EMD contract for G/C Ens.
   - (U) Complete DT&E for DERP.
   - (U) Release Request for Proposal for Firefighting Ensemble.

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

D. (U) WORK PERFORMED BY: Work for AERP is performed by Boeing Advanced Systems Company, Seattle WA. Contractors for DERP and G/C Ens to be determined. In-House development organizations are Human Systems

Program Element: #0604601F Project Number: 3337
PE Title: Chemical/Biological Defense Equipment Budget Activity: #4 - Tactical Programs

Division, Brooks AFB TX, Aeronautical Systems Division, Wright-Patterson AFB OH, and several Air Force Logistics Centers whose Headquarters is at Wright-Patterson AFB, OH.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: None.

3. (U) COST CHANGES: The cost of the Aircrew Eye/Respiratory Protection (AERP) program was reduced by $3.4M in FY 1992 and $3.8M in FY 1993. Transfer of aircraft mod kit development responsibility from Boeing Advanced Systems Company to the Air Force Logistics Centers made the reduction possible. There was no adverse technical or schedule impact. The savings were allocated to Detection and Warning (project 3321) and Collective Protection (project 3762) to satisfy other user priorities.

F. (U) PROGRAM DOCUMENTATION:
- (U) USAF SON 004-85, Sustained Operations in a Chemical/Biological Environment, 19 Sep 86.
- (U) TAF SORD (USAF 004-85)-I/II-C, Chemical/Biological Protective Overgarment, 11 May 89.
- (U) TAF SORD (USAF 004-85)-I-G, Disposable Eye/Respiratory Protection (DERP), 19 Jun 89

G. (U) RELATED ACTIVITIES:
- (U) Program Element #0207593F, Chemical Biological Defense Program.
- (U) Program Element #0602202F, Human Systems Technology.
- (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 #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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|

Program Element: #0604601F Project Number: 3337
PE Title: Chemical/Biological Defense Equipment Budget Activity: #4 - Tactical Programs

| | | | | | |
|---|---|---|---|---|---|
| AERP | 18,142 | 15,100 | 13,100 | Cont | TBD |
| A/C Ens | 23,459 | 5,050 | 6,710 | Cont | 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 | Apr 91 |
| Program Management Responsibility Transfer | Sep 91 |
| Complete Anti-Drown Device Development | Sep 92 |

2. (U) AERP Modifications

| | |
|---|---|
| Complete DT&E/IOT&E for B-52 | Sep 91 |
| Complete DT&E/IOT&E for B-1B | Sep 92 |
| Complete Modification kit development for all remaining aircraft | Sep 93 |

3. (U) Disposable Eye/Respiratory Protection (DERP)

| | |
|---|---|
| Contract Award | Aug 92 |
| First Article Test | Jul 94 |
| Start Production Delivery | Oct 94 |

4 (U) Ground Crew Uniform

| | |
|---|---|
| Contract Award | Dec 92 |
| First Article Test | Jul 94 |
| Start Production Delivery | Sep 94 |

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604602F
PE Title: Armament/Ordnance Development

Budget Activity: #4 - Tactical Programs

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2784 | Armament Standardization/Control/Munitions Materiel Handling Equipment (MMHE) | | | | |
| | 154 | 2,284 | 1,674 | Cont. | TBD |
| 3133 | Bombs and Fuzes | | | | |
| | 300 | 800 | 1,284 | Cont. | TBD |
| 4003 | Adverse Terrain Ammunition Assembly Trailer/Adverse Terrain Tow Vehicle (ATAAT/ATTV) | | | | |
| | 0 | 700 | 2,085 | Cont. | TBD |
| 4070 | Ammunition/Bullets | | | | |
| | 1700 | 0 | 0 | 0 | 1700 |
| 5613 | Containers (CDRS) | | | | |
| | 100 | 1,682 | 1,157 | Cont. | TBD |
| Total | 2,254 | 5,466 | 6,200 | Cont. | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: Extensive budget reductions in FY 91 cut all projects severely only sustaining a minimum degree of work. FY 92 funding was restored to a level adequate to meet program objectives. This program funds four (4) Air Force required projects. The Armament Standardization/Control/Munitions Material Handling Equipment (MMHE) Project and the Container Design Retrieval System (CDRS) Project satisfy several USAF and tri-service requirements for standardization of armament and support equipment. This project saves the Air Force money by eliminating unnecessary duplication of MMHE and containers. The Bombs and Fuzes Project satisfies TAF ROC 323-75, Proximity Fuzes, dated 2 Sep 75; TAF SON 305-85, Hardened Target Munitions, dated 14 Oct 86; OSD letter requirement for a common bomb fuze, dated 11 Apr 80; SAC message 041901Z Feb 87, M117 High Drag Capability(s); and Joint Mission Need Statement TAF 401-91 for Adverse Weather Precision Strike Capability, dated 4 Nov 91. This project funds development of specific fuze types for air-to-ground munitions. The Adverse Terrain Ammunition Assembly Trailer/Adverse Terrain Tow Vehicle (ATAAT/ATTV) Project satisfies TAF SON 314-87, ATAAT/ATTV, dated 18 Nov 88, and funds development of an improved munitions trailer and tow vehicle. Project 4070 was initiated in response to a DESERT STORM requirement for an improved 40mm round for Air Force Special Forces.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 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. The DAC acts as the USAF liaison to Joint Technical Coordinating Group (JTCG) for Munitions Development.

Program Element: #0604602F
PE Title: Armament/Ordnance Development

Budget Activity: #4 - Tactical Programs

The MMHE Focal Point is responsible for precluding proliferation and duplication of, as well as the development of improved munitions handling equipment.

(U) FY 1991 Accomplishments:

- (U) Established the Air Munitions Database for MIL-STD-1760A to assist System Program Offices (SPOs) at Eglin AFB and Wright-Patterson AFB. Provided the first Read Only Memory (ROM) capability of 1760A weapons status to the user. Also, designed the first database for MMHE in the Air Force; serves as the baseline for the Air Force's Support Equipment Automated System (SEAM) program.
- (U) Continued update of the MMHE Database to further incorporate DoD, foreign service and industry material handling equipment.
- (U) Developed a "Combat Checklist" highlighting design shortfalls of munitions which directly impact munitions support of combat sortie generation; distributed among the SPOs and LABs at Eglin AFB and Wright-Patterson AFB.
- (U) Published fourth printing of Air Force pamphlet fully detailing MAJCOM authorized locally manufactured equipment (LMME).
- (U) Assumed program management responsibility for the Air Force's Six (6) Inch Bomb Roller Program.
- (U) Completed the final design of the M-10 Missile Adapter for all Air-to-Air Missiles. Level II Drawings were provided to SA-ALC for procurement, 15 August 1991.
- (U) Completed design and initiated procurement action for Universal Wing and Fin Rack for all Air-to-Air, AGM-45 and AGM-88 Missiles.
- (U) Designed; built, tested and fielded as a LMME a Six (6) Bomb Bar Beam for SAC and the TAF; enhancing combat generation of munitions by enabling movement of six bombs at a time.
- (U) Designed, built and tested a Universal Bomb Assembly Tool for SAC and TAF. Cost Focal Point: $60.00 to build, it replaces a $1200.00 took kit and enhances bomb assembly.
- (U) Hosted and funded Worldwide MMHE Conference.
- (U) Numerous other concept/development efforts completed involving munitions handling and storage equipment.

(U) FY 1992 Planned Program:

- (U) Provide logistics/engineering assistance to the Society of Automotive Engineers (SAE) for further development and growth of MIL-STD-1760.
- (U) Continue implementation of MIL-STD-1760A as the SAF/AQ Implementing Control Agent for Armament Stores.
- (U) Continue update of the MMHE Database to incorporate DoD, foreign service and industry material handling equipment.
- (U) Develop, prototype, and test an AGM-130 all-up-round stacking device.
- (U) Initiate an exploration effort to locate and evaluate available systems that may be used for air transport and storage of built-up, out-of-container missiles ( i.e. Air Transportable Missile Storage Racks).
- (U) Initiate design of improved trailer deck for All Terrain Ammunition Assembly Trailer (ATAAT).
- (U) Complete the 4th publication of the Worldwide LMME Phamplet.
- (U) Support WR-ALC and MAJCOM efforts to improve R&M of munitions tow vehicles.
- (U) Perform evaluation of R&M problems with the Rapid Assembly Munitions System discovered during Desert Storm Operations.

Program Element: #0604602F
PE Title: Armament/Ordnance Development

Budget Activity: #4 - Tactical Programs

(U) FY 1993 Planned Program:
- (U) Continue technical assessments of MAJCOM munitions workforce capabilities.
- (U) Continue update of the MIL-STD-1760A and MMHE databases.
- (U) Continue to assist SA-ALC and MAJCOMs in alleviating R&M problems with production MHU-141 and MHU-110 Munitions Trailers.
- (U) Continue the exploration effort to locate and evaluate available systems that may be used for air transport and storage of built-up, out-of-container missiles (i.e. Air Transportable Missile Storage Racks).
- (U) Complete actions to obtain a TCTO for the MHU-110 Munitions Trailer to incorporate the Light-weight Tow Bar; alleviating a safety hazard.
- (U) Support Next Generation Bomblift program.
- (U) Continue design and prototype of ATAAT Trailer Deck.

(U) Worked Performed By: Program is managed by the Aeronautical Systems Division (ASD/ALZ), Eglin AFB, FL. Contractors: Sverdrup Technologies (Technical Engineering Acquisition Support [TEAS]), Tullahoma, TN; RMS Technologies Inc (Technical Engineering Acquisition Management Support [TEAMS]), Marlton, NJ.

(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.

2. (U) Project 3133, Bombs and Fuzes: This project develops and improves conventional bombs and fuzes.

(U) FY 1991 Accomplishments:
- (U) Successfully completed High Gear SAC Delay Fuze Testing.

(U) FY 1992 Planned Program:
- (U) Production contract award for BSU-93/B
- (U) Plan acquisition of high/low drag proximity sensor for General Purpose Bombs.
- (U) Plan acquisition of Multifunction Joint Service Fuze effort for the Joint Direct Attack Munition (JDAM) Program.

(U) FY 1993 Planned Program:
- (U) Initiate acquisition of Joint Direct Attack Munition (JDAM) multifunctional fuze.
- (U) Continue production of BSU-93/B and transition BSU-93/B to OO-ALC.
- (U) Continue development of Proximity Sensor for General Purpose Bombs.

(U) Work Performed By: Program is managed by Aeronautical Systems Division at Eglin AFB, FL. Contractor(s): Thorn EMI, UK. Proximity Sensor Fuze contractor(s) TBD.

Program Element: #0604602F
PE Title: Armament/Ordnance Development

Budget Activity: #4 - Tactical Programs

(U) Related Activities:
- (U) PE #0604618F, Joint Direct Attack Munition (JDAM).
- (U) PE #0604327F, Hard Target Munitions (HTM).
- (U) There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

(U) Other Appropriation Funds ($ in Thousands):
- (U) PE #0208030F, WRM - Ammunition.

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| BSU-93/B Procurement | 0 | 14,120 | 10,858 | Cont. | TBD |

(U) International Cooperative Agreements: Not Applicable.

3. (U) Project 4003, Adverse Terrain Ammunition Assembly Trailer/Adverse Terrain Tow Vehicle (ATAAT/ATV): This project will develop a munition assembly trailer and tow vehicle capable of transporting and assembling munitions in support of aircraft sortie generation at damaged or bare base airfields.

(U) FY 1991 Accomplishments:
- (U) Phase II SBIR contract awarded to investigate modification of the MHU-110/M to meet user requirements for an adverse terrain trailer.
- (U) Design and fabrication of two prototype ATAAT modifications to MHU-110/M trailers.

(U) FY 1992 Planned Program:
- (U) Build and Test final prototype ATAAT design against user requirements.
- (U) Complete Phase II SBIR contract.

(U) FY 1993 Planned Program:
- (U) Qualify ATAAT design and ATTV "off-the-shelf" tow vehicle to user requirements in preparation for FY94 production.

(U) Work Performed By: Program is managed by Aeronautical Systems Division at Eglin AFB, FL. Contractor(s): North American Dynamics, Tustin CA (SBIR).

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

Program Element: #0604602F
PE Title: Armament/Ordnance Development

Budget Activity: #4 - Tactical Programs

(U) Other Appropriation Funds ($ in Thousands):
(U) PE #0208030F, WRM - Ammunition.

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| ATAAT Procurement | 0 | 0 | 0 | Cont. | TBD |
| ATTV Procurement | 0 | 0 | 0 | Cont. | TBD |

(U) International Cooperative Agreements: Not Applicable.

4. (U) Project 4070, Ammunition/Bullets: This project was initiated in response to a DESERT STORM requirement for an improved 40mm round, the PGU-31/B, for Air Force Special Forces. This round had increased lethality and range against light armor as compared to the existing PGU-9A/B and minimized collateral damage.

(U) FY 1991 Accomplishments:
- (U) Provided funding for qualifying the PGU-31/B round for use by Air Force Special Forces.

(U) FY 1992 Planned Program:
- (U) Not Applicable

(U) FY 1993 Planned Program:
- (U) Not Applicable

(U) Work Performed By: Contractor was AAI Corportation, Hunt Valley, MD.

(U) Related Activities:
(U) PE #116040BB - Anti-Personnel Weapon for AC-130 Gunship
(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.

5. (U) Project 5613, Containers: This project funds operation of the tri-service Container Design Retrieval System (CDRS). This system includes the maintenance of a container database to preclude proliferation and duplication of munitions containers. It also supports organic container design, prototyping, and testing capabilities.

(U) FY 1991 Accomplishments:
- (U) Operated and updated the CDRS database.
- (U) Saved $5.8M through reuse of surplus DoD containers and designs.
- (U) Designed and developed containers for MILSTAR, BSU-93/B, and HAVE NAP.
- (U) Located surplus containers for first phase of Petroleum Oil Lubricant Rapid Utility Repair Kit (POL RURK).

Program Element: #0604502F
PE Title: Armament/Ordnance Development

Budget Activity: #4 - Tactical Programs

(U) FY 1992 Planned Program:
- (U) Design and develop specialized containers for the High Speed Airdrop Container (HISAC), AGM-130 all-up-round (AUR), Improved Data Link (IDL) aircraft control pod, Enhanced Container Delivery System, and T-55 Helicopter Engine.
- (U) Design cushioning and modifications for POL RURK surplus containers.
- (U) Continue development, prototyping, and testing of MILSTAR containers.
- (U) Continue container design and development efforts beyond specialized munitions containers.
- (U) Accelerate CDRS marketing efforts to potential new container customers.
- (U) Expand use of contractor personnel to maintain capabilities lost through Civil Service manning cuts.

(U) FY 1993 Planned Program:
- (U) Continue design and development efforts for Enhanced Container Delivery System.
- (U) Begin development of DSU-XX proximity sensor fuze container.
- (U) Begin design of Joint Direct Attack Munition (JDAM) container.
- (U) Continue to aggressively market CDRS and container development capabilities as a means of saving DoD funds.
- (U) Maintain in-house container testing capabilities.

(U) Work Performed By: Program is managed by Aeronautical Systems Division at Eglin AFB, FL.

(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.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604604F Budget Activity: # 4 - Tactical Programs
PE Title: Submunitions

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3166 Joint Smart Munitions Test and Evaluation Program | | | | | |
| | 7.460 | 5.033 | 7.500 | Cont | TBD |
| Total | 7.460 | 5,033 | 7,500 | 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 FY 1993:*

1. (U) Project 3166, Joint Smart Munitions Test and Evaluation Program: Evaluate munition performance against fixed/mobile ground targets.

(U) FY 1991 Accomplishments:
- (U) Conducted Captive Flight Tests (CFT) of seeker/sensors in snow and desert conditions including ten 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 Analysis, and the final reports.
- (U) Performed tower test to gather signature exploitation data on threat armor (with and without explosive reactive armor, advance ADUs, and other vehicles). Tests included first use of very high resolution instrumentation radar and included collection of fully polarmetric data.
- (U) Supported Joint Tactical Coordinating Group (JTCG) in interdiction-kill (I-Kill) analysis, and warhead characterization activities; and supported establishment of National Armor Anti-armor Data Repository (NADR).
- (U) Continued support of weapons systems (Wide Area Mine, SADARM) 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.

Program Element: # 0604604F Budget Activity: # 4 - Tactical Programs
PE Title: Submunitions

(U) FY 1992 Planned Program:
- (U) Initiate Phase III program with focus on countermeasures, both signature and ballistic.
- (U) Continue seeker/sensor evaluations and analysis, select the next generation of seeker/sensors and warheads for evaluation, and conduct Captive Flight Tests (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) Continue Phase III program with focus on countermeasures.
- (U) Initiate CFT with new seeker/sensors against the Chicken Little Target Set in various climatic settings.
- (U) Support pre-planned product improvement (P3I) programs for sense and destroy armor (SADARM) testing and smart target activated fire-and-forget (STAFF), extended range penetrator (XROD), Wide Area Mine (WAM), BAT, HELL FIRE optimized missile systems (HOMS), Sensor Fuzed Weapon (SFW), and MMW Maverick.
- (U) Continue warhead effectiveness activities and vulnerability analysis activities, continue evaluation of future warheads.
- (U) Continue support of JTCG.

(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, Wilmington MA; Lear Astronics, Santa Monica CA; and The Analytic Sciences Corp, Reading MA.

(U) Related Activities:
- (U) PE 0604607F, Wide Area Antiarmor Munitions (Sensor Fuzed Weapon (SFW)).
- (U) PE 0603628A, Field Artillery Ammunition Development.
- (U) PE 0604631A, Field Artillery Ammunition.
- (U) PE 0605807A, Munitions Standardization, Effectiveness and Safety.
- (U) Memorandum of Agreement between USAF AFDTC and USA MICOM, 15 June 1988.
- (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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2961 Sensor Fuzed Weapon (SFW) | 22,684 | 0 | 0 | 0 | 225,363 |
| Total | 22,684 | 0 | 0 | 0 | 225,363 |

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 FY 1993:

1. (U) Project 2961 Wide Area Antiarmor Munition: Develop and test the Sensor Fuzed Weapon.

(U) FY 1991 Accomplishments:
- (U) Completed Live fire testing, Air Force DT&E, and F-16 SEEK EAGLE testing.
- (U) Conducted safe jettison, bullet impact, fast cookoff, and projectile reliability tests.
- (U) Defined improved processes and producibility enhancements for the Production Transition Program.
- (U) Completed Multi-Stage Improvement Program (MSIP) trade study analysis.
- (U) Conducted final Production Readiness Review (PRR).
- (U) Conducted Functional Configuration Audit (FCA).

(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) None. FY 1991 is the last year of RDT&E funding.

(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 were 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.

Program Element: # 0604607F Budget Activity: # 4 - Tactical Programs
PE Title: Wide Area Antiarmor Munitions

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

(U) In FY 92, Army provided $4.4 million for ammunition plant facilitization.

(U) Procurement, PE 0208030F, WRM:

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 95,703 | 18,556 | TBD | TBD |
| Qty | 0 | 98 | TBD | TBD | 10,000 |

(U) Procurement, PE 0207590F, SEEK EAGLE:

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 12,947 | 0 | 0 | 12,947 |
| Qty | 0 | 108 | 0 | 0 | 108 |

(U) Military Construction: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604609F
PE Title: Reliability & Maintainability, Technology Insertion Program (RAMTIP)
Program Number: N/A
Budget Activity: #6-Defense Wide Mission Support

A.(U) RESOURCES ($ in Thousands)

| Project Title / Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Reliability & Maintainability Technology Insertion Program | 16,681 | 18,513 | 22,992 | Cont | TBD |

B.(U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: RAMTIP was initiated by the AF Chief of Staff to improve the reliability and maintainability of fielded, in-production, and future USAF systems. RAMTIP provides funding to accelerate development and transition of emerging, high-leverage technologies from the laboratory into implemented products which significantly contribute to AF R&M and cost objectives. RAMTIP selection criteria requires that projects bring a minimum 6:1 return on investment. Funding is being increased in a planned, executable pace over the POM to capture opportunities for additional cost reduction when availability could be constrained by budgets. In FY92-94, particular emphasis will be placed on implementing techniques to migrate RAMTIP products across multiple weapon systems to leverage cost and availability improvements.

C.(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) C-130 Electronic Cockpit test aircraft modification completed. Liquid Crystal Display (LCD) flat panels were installed in C-130 aircraft. Six full color liquid-crystal displays will replace over sixty analog instruments in the cockpit providing 8000 hours of mean time between critical failure. Engineering test flight completed. Aircraft returned to Little Rock AFB, for Operational Test and Evaluation. Demod scheduled for April 1992. Technology will be implemented in C-141 autopilot replacement program which is in RFP phase.
   - (U) Completed development of On-Board Inert Gas Generating System (OBIGGS). Will be flight tested in August 92. Molecular sieve bed filters nitrogen from engine bleed air to maintain an inert atmosphere in fuel tank ullage for fire suppression on the C-17. Maintains inert atmosphere in tanks under all operating conditions, including ground operations and refueling, eliminating the need for servicing aircraft with liquid nitrogen. Technology is transfusible to the C-5. Life cycle cost savings are estimated to be $30 million.
   - (U) Completed development and implementation of a F-15 Molecular Sieve Oxygen Generating System (MSOGS) -- an on-board oxygen generating system that regulates and delivers oxygen to the air crew. It replaces Liquid Oxygen (LOX) support equipment. Final report due August 92.

Program Element: #0604609F
PE Title: Reliability & Maintainability, Technology Insertion Program (RAMTIP)
Program Number: N/A
Budget Activity: #6-Defense Wide Mission Support

2. (U) FY 1992 Planned Program:
   - (U) Technology For Autonomous Operational Survivability (TAOS): A project to develop, test, and validate autonomy and survivability technology in orbital spacecraft operations. Technologies will increase durability of space systems and reduce life cycle cost due to decreased dependence on ground station monitoring and associated logistics costs. Tests a miniaturized, lightweight Global Positioning System (GPS) receiver that is generic in nature. The GPS receiver can be transfused to any aircraft that requires a miniature GPS receiver.
   - (U) Life of the Airframe Battery: Develops and qualifies a sealed Ni-Cd battery and "smart" charger system that can offer a 20-year service life on the E-8 Joint STARS aircraft. Technology is generic in nature and can be transfused to other weapon systems.
   - (U) Advanced RF Receiver Packaging: Project exploits emerging technologies of solderless connections and high-density monolithic packaging (HDMP) to double the mean time between failure to 1200 hours. These technologies will be first demonstrated on the F-16 modular low-power RF receiver. Upon successful demonstration of these technologies within the next year, the F-22 SPO will evaluate the technologies for incorporation into the F-22.

3. (U) FY 1993 Planned Program:
   - (U) Complete the development of a Digital Map System (DMS) to replace Remote Map Readers. The Digital Map System (DMS) will be implemented as a form, fit function "plus" replacement for the existing F-15E Remote Map Reader (RMR). The DMS design will be adapted from an already existing design, however, due to the F-15E mission scope, state-of-the-art mass memory technology will be selected and developed within this project to provide adequate map data coverage. Replacement of the RMR with the DMS which is primarily an all-digital design with no life-limited components will solve many of the current R&M problems.
   - (U) Directly Formed Aircraft Transparency: Joint Wright Laboratory and RAMTIP sponsored project to revolutionize the design and fabrication of fighter aircraft transparencies (windshields and canopies). The scope of the project is to develop and qualify a directly formed transparency that is a form-fit-function replacement for the current F-16 canopy at a reduced life cycle cost ($240M). It will provide much greater dimensional control of the mass produced canopies. Estimated reduction of canopy cost of between 30 and 40 percent--from $9,000 to $14,000 per canopy. This directly formed transparency will be ready for F-16 production as a preferred spare replacement for fielded F-16s in late 1995.
   - (U) Laser Ordnance Initiation System (LOIS): This project will adapt laser initiated ordnance systems for crew escape systems to satisfy the unique requirement of the B-1B crew escape system. Current explosive/pyrotechnic type devices must undergo age sensitive changeout on a four year basis. With 96 aircraft deployed in the field, maintenance is very costly. The objective of the project is to replace the existing system with an electro-optic system. The crew ejection seats and overall system operation would remain essentially the same. B-1B will budget for the new escape system as part of their required complete changeout of the energy transfer system.

Program Element: #0604609F
PE Title: Reliability & Maintainability, Technology Insertion Program (RAMTIP)

Program Number: N/A
Budget Activity: #6-Defense Wide Mission Support

- (U) Increase in FY93 funding reflects the emphasis placed on reducing costs, continue initiatives begun in FY92, and implement a minimum of three project during FY93.

D.(U) WORK PERFORMED BY: RAMTIP is located at Wright-Patterson AFB, OH. Other involved 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; General Dynamics, Ft. Worth TX; BDM International, Albuquerque NM; AT&T, Orlando FL; ITT Avionics, Clifton NJ; and Lockheed Aircraft Systems, Marietta Ga.

E.(U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: The FY 93 Descriptive Summary included proposed projects which did not have fully developed plans; accordingly, some projects were withdrawn, cancelled, or slipped. For this year's Descriptive Summary, the program office endeavored to submit projects with fully coordinated plans thereby ensuring greater probability of starting the projects in the planned year. The Fuel Cell Power for Ballistic Missile Launch slipped from an FY 91 new start to an FY 92 new start; however, it's not covered in this plan due to space limitations. The Low Observable Antenna Integration project planned for FY 92 and the Lightweight Spacecraft Antenna and the Electromagnetic Deposition projects planned for 1993 were withdrawn by the submitters. The B-2 Windshield project planned for 1992 was cancelled due to an unacceptable cost growth.
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 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 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 Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2621 Rapid Runway Repair | 501 | 3,872 | 5,600 | Cont | TBD |
| 2895 Air Base Operability | 5,314 | 2,630 | 4,000 | Cont | TBD |
| 3141 Camouflage, Concealment, and Deception | 82 | 660 | 1,100 | Cont | TBD |
| 4057 Survivable Airbase Utility Systems | 499 | 2,910 | 3,000 | Cont | TBD |
| 4058 Advanced Firefighting | 0 | 0 | 700 | Cont | TBD |
| Total | 6,396 | 10,072 | 14,400 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program continually integrates ongoing technologies to provide 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 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 1991 Accomplishments:
- (U) Initiated development of Repair Quality Criteria (RQC) for the KC-135 aircraft; completed development of RQC for additional configurations of F-15A/B/C/D, and F-111A/B aircraft with increased capability landing gear and F-16C/D aircraft.
- (U) Completed Development Test & Evaluation of Edge Markers.
- (U) Completed Phase I (evaluation of alternatives) of Advanced Crater Capping Program.

(U) FY 1992 Planned Program:
- (U) Continue development of RQC for the KC-135 and E-3A; initiate development of RQC for the KC-10.
- (U) Complete Qualitative Test & Evaluation of Edge Markers and Painting Machine.

Program Element: #0604617F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability

- (U) Award contract for Engineering and Manufacturing Development of Advanced Crater Capping Program.

(U) FY 1993 Planned Program:
- (U) Complete development of Repair Quality Criteria for KC-135 and KC-10 aircraft; perform model validation testing of the KC-10.
- (U) Continue Advanced Crater Capping Program.
- (U) Conduct Test and Evaluation of Anchors for Runway Mats.
- (U) Initiate Pre-Planned Product Improvement for Edge Marker.

(U) Work Performed By: Program contractor is BDM MSC, Panama City FL. In-House development organizations responsible for elements of the program are the Air Force Civil Engineering Support Center, Tyndall 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 Quality Assurance
- (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) Other Appropriation Funds ($ in thousands):
- (U) Other Procurement: (BA 4)

| FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|
| RRR Kits | | | | |
| 4,566 | 7,079 | 2,466 | Cont | TBD |

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 2895, Air Base Operability: Air Base Operability integrates operational concepts and technologies to improve sortie generation capability should an attack occur on an air base.

(U) FY 1991 Accomplishments:
- (U) Completed Development Test & Evaluation for the Transportable Base Recovery after Attack (BRATT) Communication System (TBCS).
- (U) Continued development of Contingency Airfield Lighting

Program Element: #0604617F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability

System (CALS).
- (U) Supported Mine Clearance Vehicle (M-60 tank with Oracle blade) refurbishment contract.
- (U) Analyzed suitability of M-113 for Explosive Ordnance Disposal/Civil Engineering ABO use.
- (U) Evaluated Armored Response Multi-Role Vehicle (ARMRV) requirements.

(U) FY 1992 Planned Program:
- (U) Complete CALS Operational Test & Evaluation (OT&E).
- (U) Conduct OT&E for the TBCS.
- (U) Conduct test for safe armory storage of 40mm grenade containers, accomplish site surveys and 500k pound explosive weight certification for Storage Modules.
- (U) Threat Document (Foreign Technology Division): Provide annual threat support for ABO development efforts.

(U) FY 1993 Planned Program:
- (U) Initiate pre-planned product improvement for CALS.
- (U) Deliver laser for Mobile Ordnance Disrupter prototype system and conduct System Design Review.
- (U) Plan and support the TBCS production contract.
- (U) Award contract for Engineering and Manufacturing Development of Buried Unexploded Ordnance Locator.
- (U) Threat Document (Foreign Technology Division): Provide annual threat support for ABO development efforts.

(U) Work Performed By: Program contractors are Sumaria Systems Inc., Wakefield MA for TBCS; Multi-Electric Inc, Chicago IL for CALS; and Alpine Industries, Ogden UT for the M-60 Oracle blade. In-House development organizations responsible for elements of the program are Electronic Systems Division, Hanscom 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 from 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.

Program Element: #0604617F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability

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

- (U) Other Procurement: (BA 4)

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| CALS | 0 | 6,041 | 5,530 | Cont | TBD |
| SBCS | 0 | 0 | 9,504 | Cont | TBD |

(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 technologies to mitigate the effectiveness of enemy attacks against air bases.

(U) FY 1991 Accomplishments:
- (U) Initiated trailerized configuration design of the Smoke/Obscurant system.
- (U) Corrected Operational Test & Evaluation concerns of the Visual Smoke Generator

(U) FY 1992 Planned Program:
- (U) Initiate Engineering and Manufacturing Development (EMD) of a multi-spectral (visual and IR) Smoke Generator.

(U) FY 1993 Planned Program:
- (U) Complete EMD for the multi-spectral Smoke Generator and conduct multi-spectral smoke/obscurant concealment evaluation.

(U) Work Performed By: Program contractor is Ball Corp, San Diego, CA for CCD Systems. In-House development organization responsible for the program are 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| CCD | 10,090 | 0 | 4,000 | Cont | TBD |

Program Element: #0604617F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability

(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 1991 Accomplishments:
- (U) Began Development, Test and Evaluation of POL RURK.

(U) FY 1992 Planned Program:
- (U) Continue development and begin Operational Test and Evaluation (OT&E) of POL RURK.
- (U) Conduct in-ground surveys and commercial practice surveys for water and sewerage RURK, and electrical RURK.
- (U) Conduct in-ground surveys for heating, ventilation, and air conditioning (HVAC) RURK and drainage RURK.

(U) FY 1993 Planned Program:
- (U) Complete development and OT&E of POL RURK.
- (U) Award Engineering and Manufacturing Development contract and conduct vulnerability tests for water and sewerage RURK.
- (U) Conduct vulnerability tests for electrical and HVAC RURK
- (U) Conduct commercial practice and portable HVAC surveys.

(U) Work Performed By: Program contractors are BDM Corporation, Panama City FL, and Idaho National Engineering Laboratories, Idaho Falls, ID. In-House development organizations responsible for the program are the Air Force Civil Engineering Support Center, Tyndall AFB FL and the Air Force Weapons Laboratory, Kirtland, AFB NM.

(U) Related Activities:
- (U) This project transitions advance development efforts from:
- (U) Program Element #0602206F, Civil Engineering & Environmental Quality Assurance
- (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) Other Appropriation Funds ($ in thousands):

Program Element: #0604617F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability

- (U) Other Procurement: (BA 4)

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| POL RURK Kits | 0 | 0 | 5,278 | Cont | TBD |

(U) International Cooperative Agreements: Not Applicable.

5. (U) Project 4058, Advanced Fire Fighting: This project will design and test vehicle hardening technology for fire/crash/rescue (FCR) vehicles. The kits will increase vehicle survivability during post-attack firefighting operations. This program will also develop a wartime training program. Without this project, firefighting vehicles would be exposed to enemy attack, thereby restricting critical recovery operations, and firefighters would not have access to safer, more cost effective, and more efficient wartime training systems.

(U) FY 1991 Accomplishments: Not Applicable.

(U) FY 1992 Planned Program: Not Applicable.

(U) FY 1993 Planned Program:
- (U) Begin development of a fire computer simulation model that is safer, more cost effective, and more efficient than current live fire training.
- (U) Begin a program to enhance survivability of FCR vehicles in a wartime environment

(U) Work Performed By: Program contractor is to be determined. In-House development organizations responsible for the program are the Air Force Civil Engineering Support Center, Tyndall 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 Quality Assurance
- (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.

Program Element: #0604617F Budget Activity: #4 - Tactical Programs
PE Title: Air Base Operability

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

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604618F
PE Title: Joint Direct Attack Munitions Budget Activity: #4 - Tactical Programs

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

| Project Title Popular Name | FY 1991 Estimate | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Joint Direct Attack Munitions (JDAM) | 0 | 0 | 33,300 | TBD | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
DESERT STORM revealed the need to deliver precision guided munitions in adverse weather. Failure to satisfy this requirement will allow the enemy to continue to take advantage of the sanctuary of weather and/or prevent US air power from prosecuting the war on its terms. The JDAM umbrella program is comprised of three inter-related phases. The Air Force is the executive lead service with the Navy in a support role. Phase I will provide an inertially guided/GPS aided (IAM/GPS) munition. The program will incorporate hardware components from the Joint Standoff Weapon (JSOW) program managed by the Navy. Phase II will be broken into two efforts. Phase IIa will be an Air Force managed fuze improvement program funded by PE 604602F (Arm/Ord Development) and will provide complete fuzing options for Air Force and Navy MK-84, BLU-109 and the new 5001b Close-Air-Support (CAS) all-up-round developed in Phase IIb. Phase IIb will be a Navy managed program funded by PE 604618N. Phase III will be an Air Force led evaluation of low cost seeker candidates to improve the accuracy of the Phase I developed weapon as well as the Navy JSOW weapon.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 ACCOMPLISHMENTS:
   - (U) Not applicable as this is a FY 1993 new start program.

2. (U) FY 1992 Planned Program:
   - (U) Not applicable as this is a FY 1993 new start program

3. (U) FY 1993 Planned Program:

Phase I
- (U) Begin IAM/GPS Engineering, Manufacturing, and Development (EMD) phase of the program.
- (U) Begin IAM Aircraft Integration Programs. The B-2 and F-15E have highest priority.

Phase II described in PE 604602F and PE 604618N.

Program Element: #0604618F
PE Title: Joint Direct Attack Munitions Budget Activity: #4 - Tactical Programs

Phase III
- (U) Begin seeker technology and mission planning evaluation.
- (U) Begin aircraft integration studies.
- (U) Prepare contract documentation for follow-on program.
- (U) Prepare detailed cost estimates.
- (U) Begin threat analysis.

4. (U) Program to Completion:

Phase I
- (U) Complete IAM EMD and integration programs.

Phase II described in PE 604602F and PE 604618N.

Phase III
- (U) Perform seeker Dem Val/EMD from 3rd Qtr FY 1995 to 1st Qtr FY 2002.

D. (U) WORK PERFORMED BY:

Phase I
- (U) The Deputy for Air-to-Surface Weapons at the Aeronautical Systems Division (ASD), Eglin AFB FL manages this program. The IAM EMD and production will be performed by a contractor selected in open competition. The IAM/aircraft integration efforts will be performed by the aircraft primes, under the sponsorship of the aircraft SPOs.

Phase II described in PE 604602F and PE 604618N.

Phase III
- (U) The Deputy for Air-to-Surface Weapons at the ASD, Eglin AFB FL, manages this program.

E. (U) COMPARISON WITH FY 1992 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) SAC/TAF Mission Need Statement #401-91, 4 Nov 1991.

G. (U) RELATED ACTIVITIES:

Phase I
- (U) Inertially Guided Technology Demonstration (USAF, Navy) (PE #0604602F).
- (U) Joint Standoff Weapon System (Navy, USAF) (PE #0604727N/F)

Program Element: #0604618F
PE Title: Joint Direct Attack Munitions Budget Activity: #4 - Tactical Programs

Phase II

- (U) PE #0604618N 5001b all-up-round program
- (U) PE #0604602F Fuze development

Phase III

- (U) PE #0603601F Advanced Technology Transition Demonstration.
- (U) PE #0603737D Balanced Technology Initiative.
- (U) PE #0603787F Balanced Technology Initiative.
- (U) PE #0604727N/F Joint Standoff Weapon 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):

1. (U) PROCUREMENT (Projected):

- (U) Missile Procurement PE 0207165F (BA 4, P-1 Line Item TBD)

| Phase I | Actual | Estimate | Estimate | Estimate | Complete | Program |
|---|---|---|---|---|---|---|
| Cost | 0 | 0 | 0 | 0 | 476,000 | 476,000 |
| Qty | 0 | 0 | 0 | 0 | 8000 | 8000 |
| Phase III | | | | | | |
| Cost | 0 | 0 | 0 | 0 | 533,000 | 533,000 |
| Qty | 0 | 0 | 0 | 0 | 1000 | 1000 |

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

J. (U) MILESTONE SCHEDULE:

Phase I

| | |
|---|---|
| 1. (U) Mission Need Statement | Nov 91 |
| 2. (U) EMD Start | 3rd Qtr FY 1993 |
| 3. (U) Long Lead Items and Low Rate Initial Production (LRIP) #1 | 2nd Qtr FY 1996 |
| 4. (U) LRIP #2 | 2nd Qtr FY 1997 |
| 5. (U) Required Asset Availability | 3rd Qtr FY 1997 |
| 6. (U) Full Rate Production Start | 1st Qtr FY 1999 |

Phase II Milestone schedule is in the Descriptive Summary for PE 604602F and PE 604618N.

Phase III

| | |
|---|---|
| 1. (U) Mission Need Statement | Nov 91 |
| 2. (U) Risk Reduction Start | 1st Qtr FY 1993 |
| 3. (U) Dem Val Start | 3rd Qtr FY 1995 |
| 4. (U) LRIP Start | FY 2000 |
| 5. (U) Full Rate Production Start | FY 2002 |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2866 Aeromedical/Chemical Defense Systems | 6,170 | 6,753 | 4,200 | Cont | TBD |
| Total | 6,170 | 6,753 | 4,200 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: Provides engineering development, modification, qualification, test and evaluation, procurement, and support planning of medical equipment and systems for treatment, evacuation, and prediction of wartime casualties in a chemical or conventional warfare environment. Tactical, strategic, and covert aeromedical evacuation systems and unique medical treatment equipment are developed and fielded to meet USAF medical readiness and operational requirements. Aerospace medical training systems are also developed and fielded to improve training of flight surgeons, flight nurses, medical technicians, and other medical personnel.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 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 passenger aircraft into aeromedical evacuation platforms; 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) which 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; 5) Spinal Cord Injury Transport System (SCITS) which will develop a system for aeromedical transport of spinal cord and neck injury patients/casualties from overseas to CONUS without causing additional trauma; 6) Aeromedical Equipment Evaluation (AMEE) tests off-the-shelf medical equipment to comply with electromagnetic interference standards, altitude/ decompression requirements, and FAA regulations; 7) Aerospace Medicine Training System (AMTS) will provide computer-based training to medical personnel; 8) Attrition Analysis System (THREAT) will estimate personnel attrition rates incorporating all known threats for AF planning and programming; 9) Medical Contingency System (WAR-MED) will produce a simulation model that provides iterative analysis of manpower and resource allocation

Program Element: #0604703F Budget Activity: #4 - Tactical Programs
PE Title: Aeromedical/Chemical Defense Systems

of the wartime medical system; 10) Operational Analysis performs modeling and analysis to identify performance deficiencies in the existing patient regulating and transportation information system; and 11) Special Operations Medical Systems (SOMS) will provide unique medical systems and equipment for special operations forces.

(U) FY 1991 Accomplishments:
- (U) CRAF AESS - awarded contract option for MAC urgent Desert Storm requirement for ten B-767 shipsets and spares.
- (U) TBTC - awarded full scale engineering development contract.
- (U) CHATH - awarded contract for four prototype units.

(U) FY 1992 Planned Program:
- (U) SCITS - complete pre-engineering and manufacturing development (pre-EMD) study.
- (U) AMTS and SOMS - conduct pre-EMD study.
- (U) CRAF AESS - deliver shipsets and spares.
- (U) TBTC - conduct preliminary design review and begin critical item engineering tests.
- (U) CHATH - decision briefing to TAC/SG for program options.

(U) FY 1993 Planned Program:
- (U) SCITS, AMTS, THREAT, WAR-MED, and CHATH - award EMD contracts.
- (U) SOMS - develop acquisition plan.

(U) Work Performed By: Project is managed by the Aeromedical Systems Division, Human Systems Program Office, Human Systems Division (HSD), Brooks AFB, TX. The contractors are E-Systems, Greenville, TX; Arthur D. Little, Cambridge, MA; and BDM Intl Corp, McLean, VA. In-house developing organizations at Brooks AFB are the Operational Analysis Systems Division at HSD and Aeromedical Research Function of the Armstrong Laboratory.

(U) Related Activities:
- (U) PE #0602202F, Human Systems Technology.
- (U) PE #0604601F, NBC Warfare Defense.
- (U) PE #0603231F, Crew Systems and Personal Protection Technology.
- (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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2479 Common Support Equipment Development | 879 | 1,437 | 1,500 | Cont | TBD |
| 3759 Air Force Office of Support Equipment Management (AFOSEM) | 248 | 463 | 500 | Cont | TBD |
| 3852 60,000 Pound Capacity Aircraft Transporter Loader | 10,912 | 10,651 | 7,400 | Cont | TBD |
| 4127 Support Equipment Initial Requirements Computation System | 375 | 0 | 0 | Cont | TBD |
| Total | 12,414 | 12,551 | 9,400 | 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 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 provide the Tactical Air Forces with a fuel efficient generator and increased conditioned ground cooling air.

(U) FY 1991 Accomplishments:
- (U) Completed Operation & Maintenance Manuals - GPGS.
- (U) Delivered Initial Spares Support Items - GPGS.
- (U) Completed 70% review of Depot Level T.O. - GPGS.
- (U) Placed two Engineering Change Proposals on contract - AXES.
- (U) Completed Focal Spot Size - AXES.

Program Element: #0604704F Budget Activity: #4 - Tactical Programs
PE Title: Common Support Equipment

- (U) Completed Operation in Hazardous Area - AXES.
- (U) Completed Post-ECP Preliminary Design Review (PDR) - AXES.

(U) FY 1992 Planned Program:
- (U) Field/Deliver the Ground Power Generator System (GPGS).
- (U) Conduct Program Management Reviews, Integrated Logistics Support Meetings, and Depot Support Technical Data Validations/Verifications - GPGS.
- (U) Acquire Depot Level Support Equipment - GPGS.
- (U) Conduct Critical Design Review (CDR) for Advanced X-Ray System (AXES).
- (U) Conduct Program Management Reviews, Integrated Logistics Support Meetings, Test Planning Working Group Meetings, and In-Process Review Meetings - AXES.
- (U) Conduct Developmental Test and Evaluation - AXES.
- (U) Validate Operational Technical Manuals - AXES.
- (U) Complete Engineering Change Proposals (ECP) for Production Options - AXES.

(U) FY 1993 Planned Program:
- (U) Continue GPGS Program.
- (U) Conduct Initial Operational Test & Evaluation (IOT&E) - AXES.
- (U) Conduct Functional Configuration Audit - AXES.
- (U) Verify Operational Technical Manuals - AXES.
- (U) Exercise Production Option - AXES.

(U) Work Performed By: The top contractors are Teledyne Power Systems (TPS), 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Advanced X-Ray System (AXES) | | | | | |
| Cost | 0 | 0 | 5,381 | 10,991 | 16,372 |
| Qty | 0 | 0 | 144 | 288 | 432 |
| Ground Power Generator System (GPGS) | | | | | |
| Cost | 83,630 | 0 | 0 | 190,116 | 394,171 |
| Qty | 249 | 0 | 0 | 650 | 1,245 |

Program Element: #0604704F Budget Activity: #4 - Tactical Programs
PE Title: Common Support Equipment

(U) International Cooperative Agreements: Not Applicable.

2. (U) Project 3759, Air Force Office of Support Equipment Management: This project develops the tools and training required to increase support equipment (SE) standardization throughout DoD, reduce proliferation of SE, and improve weapon system interoperability. The Support Equipment Acquisition Management System (SEAMS) now provides, for a SE Manager, on-line search of DoD stock listed SE for new and modified weapon system; by required SE characteristics. Resident on the automated database are the official MIL-HDBK-300, STAM & STAM2 lists, AF SIL & PIL, and MATE & MMHE modules; comprising about 10,000 items of SE.

(U) FY 1991 Accomplishments:
- (U) Refined the Automated SE Extraction Data System (ASEEDS) tables so the software can identify differences between SE information in SEAMS and the Defense Logistics Service Center (DLSC) Integrated Data System (DIDS).
- (U) Documented through Enterprise Analysis improvements needed to SE acquisition tools and training materials.

(U) FY 1992 Planned Program:
- (U) Use ASEEDS to expand the SEAMS database to include technical information on numerous additional items of SE from the DIDS.
- (U) Develop a full Functional Description and Logical Database Model for SEAMS.
- (U) Maintain and enhance SEAMS database.
- (U) Conduct a formal MIL-HDBK-300 Use Survey.

(U) FY 1993 Planned program:
- (U) Maintain and enhance SEAMS database.
- (U) Develop a System Architecture for SEAMS.
- (U) Develop SEAMS improvements based on MIL-HDBK-300 Use Survey.

(U) Work Performed By: The top contractors are Southwest Research Institute, San Antonio, TX; RJO, Dayton, OH; and Atlantic Research Corporation Fairborn, OH. In-house organization is the Air Force Logistics Command, Center for Supportability and Technology Insertion, 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.

Program Element: #0604704F Budget Activity: #4 - Tactical Programs
PE Title: Common Support Equipment

3. (U) Project 4127, Support Equipment Initial Requirements Computation System: This project develops the system required to separate computed common support equipment buy/budget requirements into initial and replenishment segments.

(U) FY 1991 Accomplishments:
- (U) Completed Concept of Operation.

(U) FY 1992 Planned Program:
- (U) Award Development Contract.
- (U) Develop Software & Documentation.
- (U) Accomplish Test of Software.

(U) FY 1993 Planned Program:
- (U) Implement the System into the Requirements Data Bank (RDB).

(U) Work Performed By: The Top contractor is BDM, Dayton, OH. In-house organization is the Air Force Logistics Command, 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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604704F Project Number: 3852
PE Title: Common Support Equipment Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES ($ in Thousands)

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 60K Loader | 10,912 | 10,651 | 7,400 | 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 on/offload C-5, C-141, C-130, C-17, C-23, C-27, C-160, KC-10, and Civil Reserve Air Fleet (CRAF) 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 and supportable than earlier loaders because of the Reliability and Maintainability Assurance Program which results in the incorporation of high quality state-of-the-art components.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Conducted Trade-Off Studies/analysis.
   - (U) Conducted Reliability and Maintainability Assurance Program.
   - (U) Conducted System Layouts/Sub-System Conceptual Design.
   - (U) Conducted the Detailed Engineering Design.
   - (U) Conducted Preliminary/Critical Design Reviews (P/CDRs).
   - (U) Conducted Structural/Dynamic Analysis.
   - (U) Conducted Preliminary Logistics Support Analysis (LSA).
   - (U) Initiated Material Procurement to Support Prototype Fabrication and Assembly.
   - (U) Developed Prototype Manufacturing Plans.
   - (U) Completed Transition from Development to Production Plans.
   - (U) Developed Test and Evaluation Master Plan (TEMP).
   - (U) Developed Integrated Logistics Support Plan (ILSP).

2. (U) FY 1992 Planned Program:
   - (U) Complete Fabrication of Prototype Loaders.
   - (U) Start Preliminary Vehicle Testing at the contractors facility.
   - (U) Develop Test Procedure for Development Test & Evaluation (DT&E)
   - (U) Develop Test Procedures for Initial Operational Test & Evaluation (IOT&E).
   - (U) Procure Spares to support DT&E/IOT&E.
   - (U) Begin validation of Technical Manuals.
   - (U) Conduct Program Evaluation Review.
   - (U) Conduct Logistics Support Analysis (LSA).
   - (U) Continue work on the ILSP.

Program Element: #0604704F
PE Title: Common Support Equipment
Project Number: 3852
Budget Activity: #4 - Tactical Programs

3. (U) FY 1993 Planned Program:
   - (U) Complete the combined DT&E and IOT&E.
   - (U) Complete the ILSP.
   - (U) Conduct Production Readiness Reviews (PRR).
   - (U) Complete Provisioning documentation.
   - (U) Conduct Physical Configuration Audit (PCA).
   - (U) Complete validation/verification of Technical Manuals.
   - (U) Complete LSA.
   - (U) Complete Preliminary Vehicle Testing.
   - (U) Conduct Operator and Maintenance Training.

4. (U) Program to Completion:
   - (U) Incorporate IOT&E Design/Technical Manual Changes.
   - (U) Test IOT&E Changes.
   - (U) Modify Prototype Loaders to the Production Configuration and Test Modified Loaders.
   - (U) Continue Program Support and Engineering Technical Assistance.

D. (U) Work Performed By: The prime contractors are Southwest Mobile Systems, St Louis, MO; and Teledyne Brown Engineering, Huntsville, AL; 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 1992 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Maximum curb weight requirement was increased from 60,000 lbs to 66,000 lbs and reconfiguration time was increased from 60 to 90 minutes. Both changes resulted from cost trade-off analysis and provided cost savings to the unit production costs.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: The FY91 Appropriations Bill reduced the program by $6.549M. This reduction caused the program to be restructured. Funds were reprogrammed in FY91 and funding has been adjusted in FY93/94.

F. (U) PROGRAM DOCUMENTATION:
   - (U) HQ MAC Statement of Operational Need (SON), 002-89, February 1989.
   - (U) HQ MAC Systems Operational Requirements Document (SORD), 002-89-1, May 89.
   - (U) SAF/AQQ Program Management Directive (PMD), 9210(2), Mar 91.

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.

Program Element: #0604704F Project Number: 3852
PE Title: Common Support Equipment Budget Activity: #4 - Tactical Programs

H. (U) Other Appropriation Funds:

(U) Procurement (BSA/WSC):

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 0 | 0 | Cont | TBD |
| Qty. | 0 | 0 | 0 | Cont | TBD |

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

J. (U) MILESTONE SCHEDULE:

| | |
|---|---|
| 1. (U) Awarded 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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 412A Life Support Systems | 4,074 | 5,378 | 8,100 | Cont | TBD |
| 2952 F-111 Parachute Upgrade | 3,970 | 0 | 0 | 0 | 12,635 |
| 3111 Aircraft Mishap Prevention Program | 2,588 | 4,207 | 4,000 | 800 | 12,346 |
| 3812 COMBAT EDGE | 4,315 | 2,497 | 730 | 0 | 21,368 |
| Total | 14,947 | 12,082 | 12,830 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is the only Air Force program element devoted to engineering and manufacturing development (EMD) 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 EMD of emergency equipment and protective clothing and devices for non-flying personnel. Project 2952 was designed to upgrade the capability of the F-111 parachute system to slow the descent rate after ejection to a level that greatly reduces the possibility of back injuries. 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 FY 1993:

1. (U) Project 412A Life Support Systems. Provides for EMD 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 1991 Accomplishments:
- (U) Completed ACES II Advanced Recovery Sequencer (ARS) sled testing.
- (U) Awarded EMD contract for Active Noise Reduction (ANR) and Universal Water Activated Release System (UWARS).
- (U) Continued fielding LPU-9/P and HGU-53/P.
- (U) Awarded 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).

Program Element: #0604706F Budget Activity: #4 - Tactical Programs
PE Title: Life Support Systems

- (U) Conduct Initial Operational Test & Evaluation (IOT&E) of Active Noise Reduction (ANR) and Thermal Flashblindness Protective Device (TFPD) systems.
- (U) Continue Universal Water Activated Release System (UWARS) Engineering and Manufacturing Development (EMD).
- (U) Award Night Vision System (NVS) EMD contract.
- (U) Begin ANR IOT&E.
- (U) Field WAMRS.
- (U) Award contract for Passenger Smoke and Fume Protective System (PSFPS).

(U) FY 1993 Planned Program:
- (U) Conduct UWARS DT&E/IOT&E.
- (U) Continue NVS EMD.
- (U) Conduct PSFPS DT&E/IOT&E.
- (U) Increased funding for this project is due to significant testing requirements involved in certifying an ejection-safe NVS during EMD phase.

(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 166: Reverse Osmosis Desalinator, $1.999M, 2796 units; 20 Man Life Raft, $0.712M, 400 units; One Man Life Raft,

Program Element: #0604706F Budget Activity: #4 - Tactical Programs
PE Title: Life Support Systems

$0,220M, 992 units; Anti-Exposure Coveralls, $0.314M, 1182 units; Specialized Flight and Accessories, $0.780M.

- (U) Procurement (BA 4) Approp 3080, PE 72832F.

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 2,276 | 1,318 | 4,025 | 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 Safety Agency (AFSA).

(U) FY 1991 Accomplishments:
- (U) Source selection Oct-Mar.
- (U) Contract awarded 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) AFSA 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. The contractor is ETA Technologies Corp., San Diego, CA.

(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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 0 | 200 | 804 | Cont | TBD |

(U) International Cooperative Agreements: Not Applicable.

Program Element: #0604706F Budget Activity: #4 - Tactical Programs
PE Title: Life Support Systems

3. (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 1991 Accomplishments:
- (U) Conducted IOT&E.
- (U) Transitioned to full scale production.
- (U) Continued manside equipment production and F-16 modification.
- (U) Continued support equipment development.
- (U) Began 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.
- (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.

Program Element: #0604706F Budget Activity: #4 - Tactical Programs
PE Title: Life Support Systems

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Cost | 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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 0001 Weather Systems (Engineering Development) | 4,623 | 5,185 | 7,000 | Cont | TBD |
| Total | 4,623 | 5,185 | 7,000 | Cont | TBD |

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. Provides a Transportable AWDS (TAWDS) with HF capability. AWDS pre-planned product improvement (P3I) will enhance interoperability between AWDS, to theater command & control (C2) systems, and with other weather processing facilities. Also provides a Remote Briefing Capability (RBC), upgrades several software functions and develops capability to ingest meteorological satellite (Metsat) & radar data, (b) Battlefield Weather Observation/ Forecast System(BWOFS) Electro-Optical Tactical Decision Aids (EOTDA): prepares forecasts of smart weapon performance in support of mission planning. (c) Solar Electro-Optical Network (SEON) Upgrade: upgrades capabilities to detect & forecast solar activity impacting DOD systems. (d) Tactical Weather Observation System/Tactical Forecast System (TWOS/ TFS): develops capability to provide automated weather observation and forecast support to combat forces.

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

(U) Project 0001, Weather Systems (Engineering Development): Develops equipment & techniques for badly needed upgrades in AWS support.

(U) FY 1991 Accomplishments:
- (U) AWDS: Completed installation of 46 fixed AWDS (FAWDS). Completed P3I definition. Developed P3I cost study statement of work and coordinated P3I testbed plan & C2 Engineering Change Proposal (ECP).
- (U) BWOFS: Started TWOS/TFS technical alternatives cost studies.

(U) FY 1992 Planned Program:
- (U) AWDS: Continue FAWDS/TAWDS installation/acceptance. Continue P3I enhancement prototyping/development activities. Complete C2 development. Develop RBC ECP. Begin prototype testing.
- (U) BWOFS: Begin integration of Interactive Weather Analysis (IWA) onto TAC's C2 system. Complete integration and testing of PACAF IWA program.
- (U) TWOS/TFS: Prepare Request for Proposal (RFP) for presustained weather operations package.
- (U) SEON upgrade: Begin evaluation of radio telescope solar flare location technique.

(U) FY 1993 Planned Program:
- (U) AWDS: Continue installation and acceptance of FAWDS & TAWDS. Continue P3I enhancement prototyping & development. Complete RBC development and develop Command Post Weather Terminal (CPWT) & interactive AWDS ECP request. Transition C2 and RBC development to production and deployment. Continue prototype testing.

Program Element: #0604707F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: Weather Systems (Eng Development)

- (U) BWOFS: Complete integration and testing of IWA on TAC's C2 system. Begin integration of IWA onto Wing C2 System (WCCS).
- (U) TWOS/TFS: Release RFP/award contract for engineering and manufacturing development (EMD) of pre-sustained weather operations package.
- (U) SEON Upgrade: Develop specifications & RFP for FSD competitive contract to upgrade SEON radio telescopes to incorporate solar flare location capability. Conduct source selection for contractor to develop an operational Radio Solar Burst Locator.
- (U) The funding increase from FY92 to FY93 is due to the acceleration of TWOS/TFS work resulting from DESERT STORM after action recommendations.

(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/GTE 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 3):

| | Prior | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|---|
| Cost (AWDS) | 52,252 | 16,960 | 15,800 | 15,270 | 0 | 100,282 |
| Quantities | 99 | 18 | 40 | 33 | 0 | 190 |

(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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604708F Budget Activity: #4 - Tactical Programs
PE Title: Civil Engineering/Aircraft Support Equipment

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2054 Aerospace Facilities Engineering Development | 265 | 376 | 400 | Cont. | TBD |
| 2505 Aircraft Fire Fighting, Suppression and Rescue | 874 | 837 | 962 | Cont. | TBD |
| 2674 Tactical Shelters | 728 | 867 | 800 | Cont. | TBD |
| 3788 Environmental Quality* | 254 | 530 | 500 | Cont. | TBD |
| | 2121 | 2610 | 2662 | 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. This project also develops environmentally less hazardous materials, processes, and technologies to support the Chief of Staff and Secretary of the Air Force's Pollution Prevention Action Plan. Special needs of various

Program Element: #0604708F Budget Activity: #4 - Tactical Programs
PE Title: Other Operational Equipment

operational theaters, including those peculiar to the rapid deployment forces are addressed.

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 1991 Accomplishments:
- (U) Furthered development of repair kits for battle-damaged POL distribution systems.
- (U) Supported survivability analyses for the design of Crotone AB, Italy.
- (U) Developed requirements set for deployable power generators.

(U) FY 1992 Planned Program:
- (U) Initiated development of mobile bare base heating and air conditioning systems.
- (U) Initiated development of kit for emergency structural repairs to critical battle-damaged facilities.

(U) FY 1993 Planned Program:
- (U) Continue development of mobile bare base heating and air conditioning systems.
- (U) Continue development of kit for emergency structural repairs.
- (U) Initiate development of solar energy systems for military application.

(U) Work Performed By: Work is performed by the in-house developing organization, the Air Force Civil Engineering Support Agency, 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, and Project Reliance.
- (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.

Program Element: #0604708F Budget Activity: #4 - Tactical Programs
PE Title: Other Operational Equipment

(U) FY 1991 Accomplishments:
- (U) Evaluated high-reach modification to crash/rescue vehicle.
- (U) Improved Crash Truck by adding a high reach agent dispensing system.
- (U) Tested high pressure Self Contained Breathing Apparatus.

(U) FY 1992 Planned Program:
- (U) Award contract for production of improved self contained breathing apparatus.
- (U) Develop Hot Pit Refueling Fire Protection System.
- (U) Test prototype dry chemical agent system for the P-20 vehicle.

(U) FY 1993 Planned Program:
- (U) Develop firefighter training simulators.
- (U) Initiate development of hot pit fire protection system.
- (U) Complete specification for improved crash/rescue vehicle.

(U) Work Performed By: Work is performed by the in-house developing organization, the Air Force Civil Engineering Support Agency, 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, and Project Reliance.
- (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 1991 Accomplishments:
- (U) Completed production and started qualification testing of two advanced design prototype composite shelters.
- (U) Initiated and completed testing of improved EMI technologies.
- (U) Completed qualification testing on composite shelter.
- (U) Initiated study on applicability of aircraft repair technology to shelter repair.
- (U) Continued development and testing of EMP simulator.
- (U) Evaluated new door gasket designs for EMI protection.

Program Element: #0604708F Budget Activity: #4 - Tactical Programs
PE Title: Other Operational Equipment

(U) FY 1992 Planned Program:
- (U) Continue testing of EMP simulator.
- (U) Continue gasket design evaluation.
- (U) Continue ISO shelter tie down system project.
- (U) Continue TiN/ZrN coating studies.
- (U) Continue study on applicability of air craft repair technology to shelter repair.
- (U) Initiate study of High Altitude EMP (HEMP) threat criteria and shielding effectiveness requirements for shelters.

(U) FY 1993 Planned Program:
- (U) Complete testing of EMP simulator.
- (U) Complete gasket concepts study.
- (U) Complete ISO shelter tie down system project.
- (U) Complete TiN/ZrN coating studies.
- (U) Complete study on applicability of aircraft repair technology to shelter repair.
- (U) Complete HEMP threat/requirements study.

(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 1991 Accomplishments:
- (U) Began development of predictive model for atmospheric dispersion for rocket launches on mesogeographic scale.
- (U) Began the integration of aircraft and volatile organic chemical data for the emissions dispersion modeling system (EDMS) as a tool for conducting environmental assessments.

(U) FY 1992 Planned Program:
- (U) Continue predictive mesoscale model of rocket launches and complete the collection and integration of aircraft and VOC data for EDMS.
- (U) Begin assimilation and integration of JP-4/JP-8 contamination data as a tool for conducting environmental impact assessments.

(U) FY 1993 Planned Program:
- (U) Complete predictive mesoscale model for rocket launches and

Program Element: #0604708F Budget Activity: #4 - Tactical Programs
PE Title: Other Operational Equipment

integration of JP-4/JP-8 contamination data.
- (U) Provide specifications and criteria for tech order changes to replace hazardous cadmium electroplating processes with aluminum ion vapor deposition processes for depot level aircraft maintenance.

(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 Administration (FAA) Office of Environment and Energy, Washington D.C.. The in-house developing organization is the Air Force Civil Engineering and Support Agency, 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, and Project Reliance.
- (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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2485 | Survivability/Vulnerability (S/V) Assessment of Ground C3 Systems | | | | |
| | 300 | 660 | 800 | Cont | Cont |
| 3763 | S/V Assessment of Aerospace Systems | | | | |
| | 4,582 | 5,948 | 5,600 | Cont | Cont |
| TOTAL | 4,882 | 6,608 | 6,400 | Cont | Cont |

B. (U) BRIEF DESCRIPTION OF ELEMENT: Develops and demonstrates the engineering capability required for reliable, cost effective hardening procedures and hardness verification/maintenance of Air Force and DoD systems which must operate and survive in nuclear and advanced weapons (such as high power microwaves (HPM), laser, kinetic energy, particle beam, etc) environments. Develops analytic techniques and test methods to verify the hardening procedures and to assess system hardness/survivability. Project 2485 develops techniques for ground-based C3I systems. Project 3429 supported B-1B electromagnetic pulse (EMP) testing (funding completed in FY90). Project 3763 supports aerospace systems (aircraft, missiles and satellites), and establishes weapon effects guidelines, standards and survivability criteria for Air Force and DoD programs.

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

1. (U) Project 2485, S/V Assessment of Ground C3 Systems: Refine and adapt advanced technology and engineering capability for hardened design, hardness maintenance/surveillance (HM/HS) techniques required to ensure nuclear/advanced weapon survivability of C3I systems.

(U) FY 1991 Accomplishments:
- (U) Completed final report on Recovery Airfield Monitor and Status (RAMSTAT) System.
- (U) Completed design of engineering proof-of-concept for revolving shielded door for ground based facilities.

(U) FY 1992 Planned Program:
- (U) Complete design of proof-of-concept high voltage (HV) filter.
- (U) Complete testing of the shielded door design.
- (U) Develop analytic and test techniques for high frequency (HF) electromagnetic (EM) threats, including nuclear EMP and HPM.
- (U) Evaluate vulnerability of selected assets to HF EM threats.

(U) FY 1993 Planned Program:
- (U) Transition shielded door design to the operational user.
- (U) Begin testing of the HV filter.
- (U) Continue development of HF EM analysis/test techniques.
- (U) Begin testing selected assets in high power HF environments to establish S/V and to evaluate the accuracy of analytic models.

(U) Work Performed By: Mission Research Corp., Albuquerque, NM. Project managed by the Phillips Laboratory, Kirtland AFB, NM.

(U) Related Activities:
- (U) Program Element #0602601F, Advanced Weapons.
- (U) Program Element #0603605F, Advanced Radiation Technology.
- (U) Program Element #0604747F, EMP Simulation Test Facilities.
- (U) Program Element #0701111F, Airborne and C3I HM/HS.

Program Element: #0604711F Budget Activity: #3-Strategic Programs
PE Title: System Survivability (Nuclear Effects)

- (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 DoD/Service program to coordinate the efforts of the Defense Agencies and the Services in developing electromagnetic pulse (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: Supported B-1B EMP design verification test. Objectives: verify EMP design specifications, implementation, safety margins; establish a hardness maintenance/surveillance (HM/HS) baseline for B-1B; provide data to evaluate EMP hardening designs for future aircraft. (Project funding completed in FY90.)

(U) FY 1991 Accomplishments:
- (U) Completed EMP testing of B-1B.
- (U) Published final report on B-1B EMP design verification
- (U) Evaluation of present design.
- (U) Recommendations for design modifications improving the hardness of the B-1B fleet.
- (U) Recommendations for B-1B fleet hardness maintenance program.

(U) FY 1992/93 Planned Program: Not Applicable.

(U) Work Performed By: North American Aviation Operation, Rockwell International, Los Angeles, CA; Boeing Military Aircraft Company, Seattle, WA; and Aircraft Engine Group, General Electric Corp., Evandale, OH. Project managed by the Aeronautical Systems Division B-1B Systems Program Office.

(U) Related Activities:
- (U) Program Element #0604747F, EMP Simulation Test Facilities.
- (U) Program Element #0701111F, Airborne and C3I HM/HS.
- (U) There is 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, Survivability/Vulnerability (S/V) Assessment of Aerospace Systems: Supports the refinement and validation of advanced hardening techniques, S/V assessment methods, and HM/HS techniques for aerospace systems. Determine nuclear and advanced weapons S/V of systems through analysis and testing. Transfer engineering techniques to product divisions and operating commands. Starting in FY 92, this project includes survivability criteria development at the Office of Aerospace Studies, formerly included in PE 0602601F.

(U) FY 1991 Accomplishments:
- (U) Completed draft of MIL-HDBKs for aircraft EMP hardening design guidelines and verification methods.
- (U) Developed preliminary simulator designs for generation of DoD-STD-2169A high altitude EMP.
- (U) Upgraded analytical models for the prediction and evaluation of nuclear and high power radio frequency (HPRF) effects.
- (U) Developed, demonstrated a continuous wave antenna system for

Program Element: #0604711F Budget Activity: #3-Strategic Programs
PE Title: System Survivability (Nuclear Effects)

high frequency (up to 1 GHz) testing of large objects.

(U) FY 1991 Accomplishments (cont'd):
- (U) Completed preliminary design to upgrade continuous wave (CW) systems to 4 GHz range.
- (U) Supported first system level test of an F-16C aircraft to an ultra-wide band electromagnetic threat. Evaluated test instrumentation, data systems; identified needed improvements.
- (U) Developed hardened 60 GHz communications subsystems with high data rate capability. Conceptual design, breadboard and radiation testing of modules completed.
- (U) Developed and demonstrated radiation hardened microelectronics technology; completed tests of infrared sensor and 64K memory, installed improved testing capability.
- (U) Predicted nuclear enhanced space radiation environments. Completed shock acceleration, preliminary atmospheric heave models, error analysis of electron injection environment code.
- (U) Developed computer tools to model hypervelocity impact and satellite breakup. Made initial calculations of impact and initiated breakup studies. Technology base for vulnerability assessment of kinetic energy and orbital debris threats begun.
- (U) Completed hardness surveillance portable tester and transitioned to Oklahoma City Air Logistics Center.
- (U) Completed nuclear criteria study for Follow-On Early Warning System; Peacekeeper Rail Garrison, SRAM II criteria reviewed.
- (U) Published Generic (nuclear) Survivability Criteria Handbook.

(U) FY 1992 Planned Program:
- (U) Publish MIL-HDBKs on electromagnetic pulse (EMP) hardening design and verification.
- (U) Implement design upgrades to the CW simulator systems, supporting high frequency (HF) system-level test technology.
- (U) Implement recommended upgrades to HF instrumentation and data acquisition systems.
- (U) Evaluate the upgrade of antenna and instrumentation system by measuring the response of an F-16 and other test assets.
- (U) Continue support of B-2 EMP test planning effort; support development of a new generation of miniaturized instrumentation for the B-2 EMP qualification test.
- (U) Continue support of Air Force hardness maintenance/hardness surveillance programs.
- (U) Complete high data rate hardened 60 GHz communications technology development. Conduct final radiation test of packaged system and document capabilities.
- (U) Initiate feasibility studies for system survivability controller including sensor and interface requirements.
- (U) Initiate advanced technology sensor characterization for advanced weapon environments. Study hardening initiatives and recommend high payoff options.
- (U) Conduct extended hypervelocity impact computations on complete satellite models and compare with recently acquired test data.
- (U) Develop improved space environment model to predict satellite radiation dose from weapon enhanced radiation belts.
- (U) Develop testing capability for space environment interaction with satellite systems, and design an experimental program to be implemented on a future space shuttle flight.
- (U) Design and develop a large scale simulation approach using existing methods for evaluation of space systems survivability.
- (U) Conduct MILSTAR, other system nuclear criteria studies.
- (U) Develop scintillation criteria for multiburst space environments.
- (U) Update Criteria Handbook for advanced technology threats.

Program Element: #0604711F Budget Activity: #3-Strategic Programs
PE Title: System Survivability (Nuclear Effects)

(U) FY 1993 Planned Program:
- (U) Support B-2 electromagnetic pulse (EMP) qualifications test: evaluate the performance of new generation B-2 instrumentation examine the response of the B-2's advanced materials to EMP; identify any shortcomings in the analysis and test techniques used to evaluate the B-2 and recommend improvements.
- (U) Update the EMP MIL-HDBKs to include advanced materials, results of high power radio frequency (HPRF) threat evaluations.
- (U) Continue upgrades to continuous wave and HPRF simulation and instrumentation/data acquisition capability.
- (U) Continue the evaluation of HPRF effects on systems constructed of advanced materials such as carbon composites and depend on highly integrated electronics, fly-by-wire, or fiber optics
- (U) Complete characterization of integrated hardened sensor proof-of-concept, including optical coatings and cryogenic coolers.
- (U) Develop a baseline design of an engineering proof-of-concept system recovery controller that uses threat detection sensor data to recover its space system operation.
- (U) Improve space debris interaction model to include improved fracture and failure prediction. Conduct verification studies comparing predicted with test breakup experiments.
- (U) Conduct large scale simulation studies for survivability technology validation/verification, considering detail such as hardened focal plane array response to radiation and RF.
- (U) Conduct feasibility study for development of a plasma shield technology for protection of space systems against microwave threats and to reduce radar cross-section.
- (U) Manage and participate in the Critical Ionization Velocity experiment on the space test program's P91-1 satellite.
- (U) Complete the space radiation environment prediction computer code; provide improved predictions to systems program offices.
- (U) Continue threat evaluation and criteria development.
- (U) Update Generic Survivability Criteria Handbook.

(U) Work Performed By: Kaman Sciences Corp., Mission Research Corp., United International Engineering Inc, all in Albuquerque, NM. Managed by the Phillips Laboratory, Kirtland AFB, NM. Criteria work performed by Office of Aerospace Studies, Kirtland AFB.

(U) Related Activities:
- (U) Program Element #0602601F, Advanced Weapons.
- (U) Program Element #0603438F, Space Systems Survivability.
- (U) Program Element #0603605F, Advanced Radiation Technology.
- (U) Program Element #0604747F, EMP Test Simulation Facilities.
- (U) Program Element #0701111F, Airborne and C3I Hardness Maintenance/Hardness Surveillance.
- (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 DoD/Service program to coordinate the efforts of Defense Nuclear Agency and the services in developing EMP hardening technology. The Defense EMP Standards and Specifications Program 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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604727F Budget Activity: #4 - Tactical Programs
PE Title: Joint Standoff Weapons

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 64001 Joint Standoff Weapons | 0 | 0 | 5,800 | 156,200 | 162,000 |
| Total | 0 | 0 | 5,800 | 156,200 | 162,000 |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program provides for integration of the Air Force's BLU-108/B (Sensor Fuzed Weapon submunition) into the Joint Standoff Weapon (JSOW) and development testing with the F-16. The Tactical Air Forces require a capability to destroy multiple enemy tanks and other armored vehicles during a single aircraft pass with a standoff capability. This need is documented in the Mission Element Need Statement for an Improved Wide Area Antiarmor Capability.

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

1. (U) Project # 64001, Joint Standoff Weapons:
Integration of BLU-108/B submunition into JSOW.

(U) FY 1991 Accomplishments: Not applicable.

(U) FY 1992 Planned Program: Not applicable.

(U) FY 1993 Planned Program:
- (U) Conduct integration trade studies.
- (U) Award integration development contract.

(U) WORK PERFORMED BY: Prime contractors will be Texas Instruments, Lewisville, Texas, for the JSOW and associated integration, and Textron Defense Systems, Wilmington, Massachusetts, for the BLU-108/B. Program management for the BLU-108/B integration is provided by Aeronautical Systems Division, Air-to-Surface Weapons Program Office, Eglin AFB, Florida, and NAVAIR, Conventional Strike Weapons System Program Office, Arlington, Virginia.

(U) RELATED ACTIVITIES:
(U) Program Element 0604727N, (Joint Standoff Weapons)
(U) Program Element 0604607F, (Wide Area Antiarmor Munitions)
(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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| GBU-15 $P^3I$ | 14,357 | 24,656 | 8,200 | 0 | 195,982 |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Air Force has a requirement for standoff, precision-guided, air-to-surface conventional munitions. These munitions give the Air Force the capability to successfully implement the roll back of enemy air defenses and to attack critical high value targets in heavily defended areas. TAF SON 301-86, Short-Range Precision-Guided Standoff Surface Attack Weapon, 2 Nov 87, and TAF SORD 301-86-I/II/III-A, AGM-130 (GBU-15 P3I) Short Range Precision Standoff Surface Attack Weapon, 6 Nov 91, both call out the need for the AGM-130 type weapon. This program continues development efforts on the AGM-130 air-to-ground missile, which is a pre-planned product improvement to the GBU-15 guided glide bomb. The AGM-130A has a 2000-pound MK 84 warhead, 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. Remaining development efforts include the integration of the IIR seeker with the AGM-130; AGM-130 certification on the F-15E; an Improved Data Link (IDL) for use on the AGM-130 and GBU-15; and Advanced Support Equipment (ASE) to replace current GBU-15 support equipment. The IDL provides an anti-jam data link to ensure total system performance in dense friendly and enemy electronic countermeasure environments. The ASE provides increased 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. The BLU-109/B (or I-2000) hardened target penetrating warhead is planned to be integrated with the AGM-130 (called AGM-130C) in FY 1992, and is funded under PE 0604327F, Hardened Target Munitions.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:

- (U) Began DT&E phase of IDL development.
- (U) Continued integration of the AGM-130A with the IIR seeker and F-15E certification.
- (U) Continued development of the ASE.
- (U) Began low rate production of the AGM-130.

2. (U) FY 1992 Planned Program:

- (U) Continue development of the ASE.
- (U) Conduct DT&E and IOT&E of the IDL.

Program Element: #0604733F
PE Title: Surface Defense Suppression
Project Number: 3006
Budget Activity: #4 - Tactical Programs

- (U) Complete integration engineering of the AGM-130A with the IIR seeker and F-15E.
- (U) Begin integration of the automated mission planning capability.

3. (U) FY 1993 Planned Program:

- (U) Complete F-15E certification for AGM-130A carriage and launch.
- (U) Begin DT&E/IOT&E of the AGM-130A with the imaging infrared (IIR) seeker.
- (U) Complete Improved Data Link (IDL) DT&E/IOT&E test and start IDL low rate initial production.
- (U) Begin development of depot ASE test and IDL capability.
- (U) Conduct ASE DT&E/IOT&E and start production.
- (U) Begin AGM-130 production verification flight test program.
- (U) Complete integration of the automated mission planning capability.

4. (U) Program to Completion: FY 1993 is the last year of RDT&E funding.

D. (U) WORK PERFORMED BY: The Deputy for Air-to-Surface Weapons at the Aeronautical Systems Division (ASD), Eglin AFB, FL, manages this program. 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 and General Dynamics Electronics, San Diego, CA, for the ASE.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Added development of automated mission planning for the AGM-130 and GBU-15.
2. (U) SCHEDULE CHANGES: IDL DT&E start delayed 4 months. ASE procurement delayed 11 months. AGM-130A/IIR seeker integration delayed 6 months. AGM-130A full rate production decision delayed 9 months.
3. (U) COST CHANGES: FY 1992 funding increased $3.4M for development of the GBU-28/B penetrator weapon used in Desert Storm.

F. (U) PROGRAM DOCUMENTATION:

- (U) TAF 301-86, Statement of Operational Need for a Short-Range, Precision-Guided, Standoff Surface Attack Weapon (SECRET), 2 Nov 87.
- (U) TAF 301-86-I/II/III-A, System Operational Requirements Document for AGM-130 (GBU-15 P3I) Short Range Precision Standoff Surface Attack Weapon (SECRET), 6 Nov 91.
- (U) Test and Evaluation Master Plan for the AGM-130 (CONFIDENTIAL), April 1991.

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.

Program Element: #0604733F
PE Title: Surface Defense Suppression
Project Number: 3006
Budget Activity: #4 - Tactical Programs

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

1. (U) PROCUREMENT:

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| - (U) Aircraft Procurement PE 0207165F (BA 7, P-1 Line Item 70) | | | | | |
| Cost | 0 | 0 | 26,666 | 45,821 | 72,822 |
| IDL Pod Qty | 0 | 0 | 17 | 83 | 100 |
| - (U) Other Procurement PE 0207165F (BA 61, P-1 Line Item 20) | | | | | |
| Cost | 0 | 0 | 1,391 | 9,324 | 10,715 |
| ASE Qty | 0 | 0 | 0 | 20 | 20 |
| - (U) Other Procurement PE 0208030F (BA 61, P-1 Line Item 20) | | | | | |
| Cost | 0 | 0 | 5,174 | 169,736 | 175,840 |
| IDL Qty | 0 | 0 | 32 | 2568 | 2600 |
| - (U) Missile Procurement PE 0207165F (BA 42, P-1 Line Item 10) | | | | | |
| Cost | 38,434 | 69,788 | 76,078 | 1,634,246 | 1,846,446 |
| AGM-130 Qty | 48 | 120 | 110 | 3742 | 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 | 2nd Qtr FY 1993 |
| 8. | (U) Complete AGM-130A/F-15E Certification | 3rd Qtr FY 1993 |
| 9. | (U) Complete AGM-130A/IIR Seeker Integration | 1st Qtr FY 1994 |
| 10. | (U) Advanced Support Equipment Procurement | 3rd Qtr FY 1994 |
| 11. | (U) AGM-130A Full Rate Production Decision | 3rd Qtr FY 1994 |

FY 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2152 Mission/Engineering Support | 3,681 | 4,525 | 3,200 | Cont | TBD |
| 2286 Tactical Air Forces Range Equipment | 4,422 | 5,710 | 17,023 | Cont | TBD |
| 3320 Strategic Air Command Range Equipment | 3,222 | 5,735 | 4,862 | Cont | TBD |
| 3321 Electronic Combat Test Resources | 50,560 | 34,591 | 38,837 | Cont | TBD |
| 6510 Flight Test Threat Systems Simulators | 20,012* | 5,830 | 5,850 | Cont | TBD |
| Total | 81,897 | 56,391 | 69,772 | Cont | TBD |

* Includes $4.5M for the Congressionally added Range Security program.

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 1991 Accomplishments:
- (U) Continued RIP basic operating support, system software acquisition, and systems engineering support.
- (U) Continued to develop interoperability between the Air Force Measurement and Debriefing System (MDS) and Navy Tactical Air Combat Training System (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.

Program Element: #0604735F
PE Title: Range Improvement

Budget Activity: #6 - Defense-Wide Mission Support

(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 RMS Technologies, 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 range equipment, instrumentation, training emitter systems, and aircrew training systems comparable in use to those provided under the corresponding Project 2286 for the tactical forces. The primary effort supports development of a new strategic bomber aircrew training system, the Route Integration Instrumentation System (RIIS), to be employed within the existing Strategic Training Route Complex (STRC). The STRC/RIIS system will enable realistic combat training at low altitude, in varied terrain, and in an unpredictable threat environment. The Bomber Airborne Instrumentation System (BAIS) will provide a direct aircraft interface with ground system, enabling more comprehensive aircrew training at the STRC/RIIS and interaction with the Air Combat Maneuvering Instrumentation (ACMI) ranges developed under Project 2286. Development of a computer generated threat system will provide aircrew training against advanced threat systems.

(U) FY 1991 Accomplishments:
- (U) Continued STRC/RIIS development and range equipment integration. Continued development ACMI and BAIS.
- (U) Note: The FY 91 budget was cut from $10.240M to $3.687M.

(U) FY 1992 Planned Program:
- (U) Continue STRC/RIIS development and range equipment integration. Continue BAIS development.

(U) FY 1993 Planned Program:
- (U) Incorporate additional "backyard" sites into the RIIS. Continue BAIS development. Begin development of a computer generated threat system.

Program Element: #0604735F
PE Title: Range Improvement

Budget Activity: #6 - Defense-Wide Mission Support

(U) Work Performed by: This program is managed by the Aeronautical Systems Division, Eglin AFB, FL. Major contractors include GTE, Needham, MA (STRC/RIIS) and Kollsman, Nashua, MA (BAIS).

(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-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) 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Aircraft Procurement (PE 0101897F/BP19): | | | | | |
| Fund | 111 | 4,161 | 4,978 | Continuing | TBD |
| Quantity | N/A | N/A | N/A | N/A | |
| Other Procurement (PE 0101897F): | | | | | |
| Funds | 11,753 | 18,765 | 12,784 | Continuing | TBD |
| Quantity | N/A | N/A | N/A | N/A | |

(U) International Cooperative Agreements: None.

FY 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| (N/A) | 4,422 | 5,710 | 17,023 | 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 the introduction of the second generation systems capable of handling 36 aircraft simultaneously, referred to as the Measurement and Debriefing System (MDS). The next generation system is known as the Joint Air Combat Training System (JACTS) which is capable of handling up to 100 aircraft simultaneously. Each of these systems will provide the capability to train aircrews in air-to-air, air-to-ground, and electronic warfare to support aircrew combat training. These systems provide real-time monitoring and control of aircraft during training and record events for post mission debrief and analysis.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Began development of a Tactical Air Forces MDS.
   - (U) Began Air Combat Maneuvering Instrumentation (ACMI) software upgrades for joint Air Force/Army training at National Training Center (NTC).
   - (U) Continued development improvement of the aircraft interface with ACMI pods and ACMI/MDS software upgrades.

2. (U) FY 1992 Planned Program:
   - (U) Continue to develop aircraft interface with ACMI pods and ACMI/MDS software upgrades.
   - (U) Continue ACMI software upgrades for joint Air Force/Army training at NTC.
   - (U) Continue development of TAF MDS.

3. (U) FY 1993 Planned Program:
   - (U) Increase over FY 92 is needed to begin development of JACTS, the next generation MDS. This program requires significant software upgrades and development of prototype systems that will serve as a baseline for the development of follow-on systems.

Program Element: #0604735F
PE Title: Range Improvement
Project Number: 2286
Budget Activity: #6 - Defense-Wide Mission Support

- (U) Continue to develop aircraft interface with ACMI pods and ACMI/MDS software upgrades.
- (U) Begin development of JACTS, and the Range Airspace Management System (RAMS).
- (U) Begin development (through a joint, Navy lead, effort) the Message Oriented Data Security Module (MODSM), an encryption device between aircraft and ground systems.

4. (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, (ACMI); Applied Data Technology Corp, San Diego, CA (Advanced DDS); Kollsman Corp, Nashua, MA; and Metric Corp, Ft Walton Beach, FL; and Georgia Institute of Technology, Atlanta, GA.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

1. (U) Technical changes: None

2. (U) Schedule changes: RAMS slipped from FY 92 to FY 93 due to budget cuts.

3. (U) Cost changes: In FY 92 the TAF MDS upgrade was reduced from $5.564M to $3.726M due to budget cuts.

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 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.

Program Element: #0604735F
PE Title: Range Improvement
Project Number: 2286
Budget Activity: #6 - Defense-Wide Mission Support

H. (U) OTHER APPROPRIATION FUNDS ($ In Thousands):
- (U) Procurement OPAF/Electronics & Telecommunications Equipment, P-1 Line Item 129.

| | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Aircraft Procurement (PE 0207429F): | | | | | |
| Cost | 7,830 | 11,700 | 6,600 | Continuing | TBD |
| Other Procurement (PE 0207429F): | | | | | |
| Cost | 29,043 | 56,164 | 10,600 | Continuing | TBD |

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE:
(U) NTC Integration IOC: Dec 92
(U) ACU IOC: June 92
(U) RAMS IOC: Dec 95

FY 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604735F
PE Title: Range Improvement
Project Number: 2321
Budget Activity: #6 - Defense-Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

Project Title: Electronic Combat Test Resources

| Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| (N/A) | 50,560 | 34,591 | 38,837 | 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, hardware-in-the-loop (HITL) hybrid facilities, installed systems T&E facilities (ISTF), and development of range systems used in T&E. The Joint Modeling and Simulation System (J-MASS) is an Air Force lead, Tri-Service project to develop and demonstrate a DoD-wide common digital simulation architecture in support of test and evaluation. HITL facilities funded by this project are the Air Force Electronic Warfare Evaluation Simulator (AFEWES) and the Real-Time Electromagnetic Digitally Controlled Analyzer and Processor (REDCAP). 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). Also funds Rome Laboratory's precision antenna ranges operating and updated. Finally, this project funds upgrades and operation of the Radar Test Facility (RTF). The RTF is a facility for both T&E of fielded and prototype ECCM capabilities of airborne radar and EC systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

2. (U) FY 1991 Accomplishments:
- (U) J-MASS. Continued Phase I contract.
- (U) AFEWES. Completed GPSR and REDFOX. Continued others.
- (U) REDCAP upgrades. Continued Phase II contract upgrades.
- (U) ECCM. Continued PRIMES, GWEF, and EMTE upgrades. Fielded Common Test Tool Set at PRIMES.
- (U) Rome Lab. Completed fiber optic network. Constructed F-16 electromagnetic environment test bed with full avionics.
- (U) RTF. Completed Phase II of the APG-70 test bench contract. Started integration contract.

3. (U) FY 1992 Planned Program:
- (U) J-MASS. Complete Phase I. Obtain Phase II approval from OSD/DDDR&E(T&E) and Air Force. Conduct initial demo.
- (U) AFEWES. Continue MEG, TWS-10, RAI, and IRLE projects.

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- (U) REDCAP. Continue SUAWACS/BMC3 and facility upgrade projects.
- (U) ECCM. Continue PRIMES and EMTE ECCM upgrades. GWEF initial MMW capability and jamming signal analysis instrumentation.
- (U) Rome Lab. Acquire F-22 test bed. Start integration into antenna range. Complete Newport fiber optic upgrade.
- (U) RTF. Complete APG-70 test bench system integration with 2Q92 IOC. Start Advanced Medium Range Air-to-Air Missile (AMRAAM) test bench project.

4. (U) FY 1993 Planned Program:
   - (U) J-MASS. Complete Phase II. Deploy architecture DoD-wide.
   - (U) AFEWES upgrade. Complete MEG, TDS, and IRLE projects. Continue RAI project for FY94 completion.
   - (U) REDCAP upgrade. Continue SUAWACS/BMC3 and facility projects for FY94 completion.
   - (U) ECCM. Continue PRIMES, GWEF, and EMTE upgrade projects. Field two instrumentation upgrades at EMTE.
   - (U) Rome Lab. Establish ultra low sidelobe measurement capability. Start computer upgrades. Complete F-22.
   - (U) RTF. Continue AMRAAM test bench project for 4Q FY94 IOC.

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; 3246 Test Wing, Eglin AFB, FL; Rome Laboratory, Griffiss AFB, NY; and the 84 Test Squadron, Tyndall AFB, FL. Major contractors include General Dynamics Corporation, Fort Worth, TX; Calspan Corporation, Buffalo, NY; Hughes Aircraft Corporation, Los Angles, CA; Georgia Tech Research Institute, Atlanta, GA, and Rome Research Corp., Rome, NY.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: Air Force lead, Tri-Service J-MASS initiated with OSD concurrence. Program replaced the Electronic Combat Digital Evaluation System (ECDES) and Red Mission Analysis programs. Changes made to better align OSD and Air Force EC T&E infrastructure programs. Fiscal constraints forced ECIT technical de-scope and management transfer from ASD, Eglin AFB to a project managed by the 6510 Test Wing, Edwards AFB, CA.

2. (U) Schedule Changes: Numerous fact-of-life budget cuts slipped the AFEWES and REDCAP upgrades by two years in aggregate and delayed RTF APG-70 test bench IOC. ECIT deferred at least one year pending results of Congressionally directed feasibility study.

3. (U) Cost Changes: Air Force added $10M per year beginning in FY98 to complete the ECIT capability. Congress denied FY 92 funding

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for ECIT and directed comparison study. Also, starting in FY 92, funding for the BAF operations and maintenance (O&M) transferred to PE0605807F, the PE used to fund 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 (PE0604940D) partially funds J-MASS.

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.
1Q92: J-MASS initial feasibility demonstration.
2Q92: RTF APG-70 test bench IOC. GWEF initial MMW capability.
3Q93: J-MASS architecture development complete.
4Q94: AFEWES RAI project complete.
4Q94: REDCAP SUAWAC/BMC3 project complete.
4Q94: RTF AMRAAM Test Bench IOC.

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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| (N/A) | 20,012 | 5,830 | 5,850 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project funds simulator modifications necessary to maintain existing enemy threat simulators to the current intelligence baseline, and the acquisition of advanced threat 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 and to periodically verify fielded EW systems. To be effective, this testing must be conducted in an environment which accurately simulates the EC environment to include simulations of enemy threat air defenses. In the past, the adaptability of airborne electronic countermeasure (ECM) systems was quite limited; however, new threat 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 1991 Accomplishments:
   - (U) Continued to modify existing simulators to incorporate latest intelligence information; and acquired advanced signal sources. Completed HAVE COPPER radar system.

2. (U) FY 1992 Planned Program:
   - (U) Continue to modify existing simulators to incorporate latest intelligence information; and acquire advanced signal sources. Complete HAVE COPPER ground-based missile system. Begin development of an SA-10 and SA-12 emitter.

3. (U) FY 1993 Planned Program:
   - (U) Continue to modify existing simulators to incorporate latest intelligence information; and acquire advanced signal sources.
   - (U) Continue work on the SA-10 emitter, complete work on SA-12 emitter.

Program Element: #0604735F
PE Title: Range Improvement
Project Number: 6510
Budget Activity: 6 - Defense-Wide Mission Support

4. (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 1992 DESCRIPTIVE SUMMARY:
1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: HAVE PEWTER schedule was modified because the contractor did not build system to meet design specifications. The SADS IV Phase II and III were terminated and replaced by the SA-10 and SA-12 emitter programs.
3. (U) COST CHANGES: Congress denied all FY92 funding ($6.15M) for HAVE PEWTER. Simulator mods was reduced by $1.5M in FY 92 and the funds were transferred to the SA-12 emitter program. HAVE COPPER was reduced by $2.107M in FY 92 and the funds were transferred to the SA-10 emitter program. Simulator mods program was reduced by $900K in FY 93 and the funds were transferred to the SA-10 emitter program.

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) SADS IV Phase I IOC: 4Q FY 91
(U) SADS VIII Phase III IOC: 3Q FY 92
(U) SA-10 emitter: 2Q FY 94
(U) SA-12 emitter: 3Q FY 94

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0604740F
PE Title: Computer Resources Management Technology (CRMT)

Budget Activity: #4-Tactical Programs

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2522 Advanced Computer Technology Transition | * 5,605 | 3,985 | 2,900 | Cont | TBD |
| 2523 Architectural Implementation | 1,200 | 2,350 | 2,000 | Cont | TBD |
| 2524 Reuse and Reusable Component Support | 312 | 8,708 | 1,000 | Cont | TBD |
| 2983 Logistics Information Management Support System (LIMSS) | 4,702 | ** | | | |
| 3315 Computer-aided Acquisition and Logistics Support (CALS) | 1,864 | 1,954 | 3,000 | Cont | TBD |
| Total | 13,683 | 16,997 | 8,900 | Cont | TBD |

* Includes all former 2239, 2522, 2526 efforts.
** Transferred to PE 0708012 in FY 1992.

B. (U) BRIEF DESCRIPTION OF ELEMENT: Computer Resources Management Technology (CRMT) is an engineering development program that transitions technology into operational Air Force organizations. Specifically, the program addresses problems of acquiring, developing, and supporting emerging computer resources. The goal of this program is to reduce software lifecycle costs and to improve the quality of computer systems development and support.

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

1. (U) Project 2522, Advanced Computer Technology Transition: Establish the foundation for technology transition activities across all projects. Specific emphasis will be placed on accelerating technology transition by implementing technology receptor groups at each MAJCOM, with responsibility for coordinating and directing continuous process improvement at the each MAJCOM.

Program Element: 0604740F Budget Activity: #4-Tactical Programs
PE Title: Computer Resources
Management Technology (CRMT)

(U) FY 1991 ACCOMPLISHMENTS:

- (U) Continued Security Products/Transition Analysis Facility (SecurityPro/STAF) task.
- (U) Transitioned compartmented mode workstation and Haystack Audit Trail to HQ SAC.
- (U) Continued development of the Display Rapid Prototyping & Simulation (DRPS) System.
- (U) Continued INFORUM (previously named the User Requirements System) SBIR task.
- (U) Continued funding JLC support activities.
- (U) Awarded contract to enhance/productize the Software Lifecycle Support Environment (SLCSE) tool.
- (U) Began developing reusable software repository.

(U) FY 1992 PLANNED PROGRAM:

- (U) Continue SecurityPro/STAF task.
- (U) Complete the System Lifecycle Risk Reduction (SLRX) tool and transition to NTB/JPO.
- (U) Continue INFORUM.
- (U) Continue funding JLC activities.
- (U) Continue SLCSE enhancements and productization.

(U) FY 1993 PLANNED PROGRAM:

- (U) Continue SecurityPro/STAF task.
- (U) Continue technology transition of SLRX.
- (U) Continue funding JLC activities.
- (U) Continue SLCSE technology transition.

(U) WORK PERFORMED BY: Work is performed by the MITRE Corp., Bedford, MA; UNISYS Corp., Paoli, VA; Titan Corp., Westboro, MA; Intermetrics Corp., Cambridge, MA; Downey-Dalton, Inc., Boston, MA; Hughes Aircraft Co., Fullerton, CA; Bernier & Associates, Topsfield, MA; Software Engineering Institute, Pittsburgh, PA; DSD Laboratories, Inc., Sudbury, MA; AT&T, Greensboro, NC; International Software Systems, Inc., Austin, TX; Bremer Assoc., Inc., Cambridge, MA.

(U) RELATED ACTIVITIES:

- (U) Program Element #0603728F, Advanced Computer Technology
- (U) Program Element #0603752F, 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
PE Title: Computer Resources
Management Technology (CRMT)

Budget Activity: #4-Tactical Programs

(U) OTHER APPROPRIATION FUNDS: None.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

2. (U) Project 2523, Architectural Implementation:
Develop, through rapid prototyping and interaction with Air Force users, a generic architecture for support of command and control applications. The architecture will address the components common to most command centers (e.g., message processing, display processing, user interfaces) and will focus on the migration of multilevel computer security applications/technologies into AF operations.

(U) FY 1991 ACCOMPLISHMENTS:
- (U) Source selection for PRISM (Portable, Reusable, Integrated Software Modules).

(U) FY 1992 PLANNED PROGRAM:
- (U) Initiate domain analysis for command centers.
- (U) Initiate development of generic command center architecture and methodology to qualify software components as reusable components.
- (U) Initiate identification of multilevel security issues and solutions.
- (U) Initiate rapid prototyping plan to support operational users.

(U) FY 1993 PLANNED PROGRAM:
- (U) Interface to other software repositories.
- (U) Demonstrate generic command center capability.
- (U) Provide rapid prototyping services to users/acquisition agencies.

(U) WORK PERFORMED BY: Raytheon Company, Sudbury, MA; Hughes Aircraft Company, Fullerton, CA.

(U) RELATED ACTIVITIES:
- (U) Project 2524, Reuse and Reusable Component Support
- (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.

Program Element: 0604740F Budget Activity: #4-Tactical Programs
PE Title: Computer Resources
Management Technology (CRMT)

3. (U) Project 2524, Reuse and Reusable Component Support: Develop a documented knowledge for establishing software reuse libraries that support specific application domains. These libraries will support system engineers through the reuse of large scale software components. Existing software reuse programs will be used to the maximum extent possible.

(U) FY 1991 ACCOMPLISHMENTS:
- (U) Began developing reuse blueprint.
- (U) Established a prototype library to develop concepts/procedures.
- (U) Command & control domain selected for prototype library.

(U) FY 1992 PLANNED PROGRAM:
- (U) Complete blueprint and populate library with miniman set of programs.
- (U) Select a second (MCCR-Embedded) domain to test blueprint.
- (U) Expand library functionality.

(U) FY 1993 PLANNED PROGRAM:
- (U) Demonstrate interoperability to other reuse libraries.
- (U) Apply blueprint to other domains.
- (U) Provide support and training to the second domain.

(U) WORK PERFORMED BY: UNISYS, Reston, VA.

(U) RELATED ACTIVITIES:
- (U) Project 2523, Arch. Implementation.
- (U) Common Ada Missile Packages Program.
- (U) STARS Asset Source for Software Engineering Technology (ASSET) Project.
- (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. (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.

Program Element: 0604740F
PE Title: Computer Resources
Management Technology (CRMT)

Budget Activity: #4-Tactical Programs

(U) FY 1991 Accomplishments:
- Completed Logistic Support Analysis study.
- Successfully combined AFSC/AFLC CALS efforts into Materiel Command CALS program office.
- Completed Air Force portion of CALS EXPO 91.

(U) FY 1992 Planned Program:
- Revise Air Force CALS Master Plan due to new Air Force Materiel Command and Integrated Weapon System Mgmt.
- Support Air Force portion of CALS EXPO 92.
- Provide Air Force support to Joint CALS Management Office.
- Develop CALS training plan and AFIT courses.

(U) FY 1993 Planned Program:
- Update Air Force CALS architecture.
- Plan and execute CALS EXPO 93.
- Continue development of Technical management standards and specifications.

(U) Work Performed By: RJO Enterprises, Inc. Lantham MD and I-NET Bethesda MD.

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

(U) Other Appropriation Funds: 78012F - $ 25.7M.

(U) International Cooperative Agreements: None.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 1209 EMP Simulation Test Facilities | 2,787 | 2,187 | 3,678 | Cont | TBD |
| 2064 HAVE NOTE | 1,915 | 961 | 1,000 | Cont | TBD |
| Total | 4,702 | 3,148 | 4,678 | Cont | TBD |

(U) BRIEF DESCRIPTION OF ELEMENT: Funds operation, maintenance, and improvements 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. Funding is required to insure weapons systems and command, control, communication, and intelligence (C3I) systems can operate in EMP environments during Emergency War Order contingencies and non-nuclear electromagnetic radiation (EMR) environments during conventional operations.

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.

(U) FY 1991 Accomplishments:
- (U) Completed EC-135, and SRAM II, and DSMDPS EMP tests.
- (U) Continued EMPTAC support.
- (U) Completed initial SINCGARS EMP TEST.

(U) FY 1992 Planned Program:
- (U) Continue EMPTAC support.
- (U) Initiate planning for B-2 Systems Level EMP testing.
- (U) Conduct B-2 Fuse Test.
- (U) Maintain capability to support MAJCOM EMP T&E and operational support requirements as required.
- (U) Note: The total FY 92 program was cut from the orginal budget request of $4.768M to $3.148M. Project 1209 cut from $3.807M to $2.187M.

Program Element: #0604747F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: Electromagnetic Radiation (EMR) Test Facilities

(U) FY 1993 Planned Program:
- (U) Continue planning for B-2 System Level EMP testing.
- (U) Conduct B-1B hardness maintenance and surveillance test.
- (U) Maintain capability to support MAJCOM EMP T&E and operational support requirements as required.
- (U) Continue EMPTAC support.
- (U) Note: The apparent ramp in the Descriptive Summary from FY92 $3.148M to FY 93 $4.678M is actually a reduction to the original FY 92 estimate of $4.786M and the FY 93 estimate of $5.163M.

(U) Work Performed by: Project 1209 is managed by the Phillips Laboratory, Kirtland AFB, NM. BDM International, Inc., McLean, VA, is the facilities support contractor.

(U) Related Activities:
(U) Project 2064 HAVE NOTE.
(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 2064, HAVE NOTE: Develops, acquires, improves and supports the Rome Laboratory EMR test facilities. 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 fuse and subsystem evaluations; and a radio frequency (RF) and microwave instrumentation development facility. The electromagnetic susceptibility data is used to perform weapon system and C3I system vulnerability assessments and update test methods, acquisition specifications, hardening design guidelines, and maintenance of technical orders.

(U) FY 1991 Accomplishments:
- (U) Completed vulnerability assessment of the three SFW weapon system components of the FSD hardware.
- (U) Continued support to AMRAAM JSPO, SFW SPO, AGM-130 SPO, and GBU-15/AGM-130 Improved Data Link (IDL) SPO.
- (U) Began replacement of twelve year old Data Acquisition and Control System (ADACS) hardware.
- (U) Completed Reverbation Chamber FY 1990 improvements.
- (U) Began measurement support of the F-16 Phase III High Power Microwave (HPM) assessment.

(U) FY 1992 Planned Program:
- (U) Begin vulnerability evaluations of the Improved Data Link (IDL) for the GBU-15/AGM-130 and AGM-130 weapon.
- (U) Continue AMRAAM support to program office for the AMRAAM Producibility Enhancement Program (APREP).
- (U) Begin support to AGM-137 program office.
- (U) Begin support to SFW production program.
- (U) Continue F-16 Phase III HPM measurements and assessment.
- (U) Continue ADACS hardware replacement. Start software system integration.

Program Element: #0604747F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: Electromagnetic Radiation (EMR) Test Facilities

- (U) Begin revision of MIL-HDBK-335, "Guide to Weapon System Hardening."
- (U) Begin planning for Reverberation Chamber low frequency capability improvements, extensions, and upgrades.

(U) FY 1993 Planned program:
- (U) Complete vulnerability assessments of AGM-130 standoff weapon and GBU-15/AGM-130 IDL.
- (U) Continue support to AGM-137 program.
- (U) Begin vulnerability evaluations of AMRAAM Producibility Enhancement Program (APREP) and SFW production hardware.

(U) Work Performed by: Project 2064 is managed by Rome Laboratory, Griffiss Air Force Base, NY. The facility and engineering support contractor is Rome Research Corporation, New Hartford, NY.

(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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 1174 Intelligence Security Equipment | 952 | 0 | N/A | N/A | 15,300 |
| 2053 Foreign Aerospace Science & Technology Center Intelligence Processes | 2,888 | 2,944 | 3,000 | Continuing | N/A |
| TOTAL | 3,840 | 2,944 | 3,000 | 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 FY 1993:

1. (U) Project 1174, Intelligence Security Equipment:

This project develops equipment to [redacted] 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 1991 Accomplishments:

Program Element: #0604750F Budget Activity: #4 - Tactical Programs
PE Title: Intelligence Equipment

(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) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

2. (U) Project 2053, Foreign Aerospace Science & Technology Center (FASTC) Intelligence Processes: FASTC's mission is to acquire, evaluate, analyze and report on foreign scientific and technological progress in response to Department of Defense/Defense Intelligence Agency tasking. The advent of

] This project improves the FASTC 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.

(U) FY 1991 Accomplishments:

(U) FY 1992 Planned Program:

-(U) Complete Phase III of the Advanced Systematic Analysis Production (ASAP) expert system.

Program Element: #0604750F Budget Activity: #4 - Tactical Programs
PE Title: Intelligence Equipment

-(U) Initiate development of software programs to model foreign aerodynamic missiles employing low observable technology.

(U) FY 1993 Planned Program:

-(U) Provide an enhanced Electronic Counter Measures (ECM) techniques modeling capability to the existing Foreign Aerospace Science & Technology Center (FASTC) equipment.
-(U) These are both new efforts which were costed separately 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, Albuquerque, NM; HRB Systems, State College, PA.

(U) Related Activities: PE 0301310F (FASTC).

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1993 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 1991 | FY 1992 | FY 1993 | To Complete |
|---|---|---|---|---|
| Major Contract | 19,146 | 8,748 | 3,480 | 29,928 |
| Support Contract | 14,109 | 657 | 8,490 | 27,240 |
| In-House Support | 2,395 | 447 | 361 | 1,422 |
| GFE/ Other | 1,444 | 5,288 | 4,169 | 5,410 |
| Total | 37,094 | 15,140 | 16,500 | 64,000 |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | To Complete |
| Program Milestones | | | MS IIIB CL 2/2H October | |
| Engineering Milestones | | FCA/PCA (A/F Configurations) | FCA/PCA (Navy Config. & Army CL2M) | |
| T&E Milestones | Conduct Multi Platform Testing | AF/Navy Joint OT&E | Army/AF Joint OT&E | |
| Contract Milestones | Lot 2 Production | Lot 3 Production | Lot 4 Production | Full Rate Production |

Program Element: #0604754F
PE Title: Joint Tactical Information Distribution System (JTIDS)
Project Number: P771
Budget Activity: #4-Tactical Programs

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The objective of this program is to provide near-real-time command and control (C2) information for execution of tactical air, sea, and land operations. The Joint Tactical Information Distribution System (JTIDS) will interconnect diverse C2 elements into an integrated system to cope with modern tactical warfare and provide the battlefield commander with timely information to assesss the military situation and employ combat forces. It is a highly jam resistant, secure digital information distribution system for use in a tactical combat environment. 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 1991 Accomplishments:
   - (U) Awarded contract for for Production Improvement Phase I, common Central Processing Unit (CPU) modification and associated software retarget. Prototype CPU in test.
   - (U) Awarded contracts for LRIP Lot 2 (E-3 and Navy) terminals.
   - (U) Continued development of depot level test program sets and other depot activation requirements.
   - (U) Conducted joint service, multi-platform testing.
   - (U) Continued Class 2 terminal software development.
   - (U) Selected a government centralized software support activity (CSSA) for JTIDS; Warner-Robins-Air-Logistics Center (WR-ALC), Robins AFB, GA.
   - (U) Conducted AF Class 2/2H development testing.
   - (U) Deployed/supported Class 2 terminals in E-8 during Desert Storm.
   - (U) Achieved 400 hour mean-time-between failure for Class 2 Terminal.
   - (U) Initiated JTIDS integration for Airborne Battlefield Command and Control Center (ABCCC) through ABCCC Improvement Program.
   - (U) Continue system integration and software development for Modular Control Equipment (MCE).

2. (U) FY 1992 Planned Program:
   - (U) Achieve 400 hour mean-time-between failure for Class 2H (High Power Terminal).
   - (U) Award contract for Production Improvement Phase 2, Common Signal Processor and associated software.
   - (U) Continue system integration and software development for ABCCC and MCE .
   - (U) Accept delivery of LRIP Lot 1 Class 2 production terminals.
   - (U) Continue development of common software for Joint Service terminals.
   - (U) Begin activation of service Interface Software Support Activities (ISSA).
   - (U) Identify and acquire Air Force Intermediate Level Support Equipment (ILSE) common to all Air Force.
   - (U) Award contract for follow-on development work (software upgrades).
   - (U) Award contract for LRIP Lot 3 (Navy) production.
   - (U) Conduct joint Air Force/Navy OT&E.
   - (U) Obtain expanded spectrum certification.

3. (U) FY 1993 Planned Program:
   - (U) Start final retarget of all software to Common CPU.

Program Element: #0604754F Project Number: P771
PE Title: Joint Tactical Information Distribution System (JTIDS) Budget Activity: #4-Tactical Programs

- (U) Continue product improvement efforts
- (U) Continue interoperability efforts.
- (U) Develop ILSE Test Program Sets; field Intermediate Level Support Equipment (ILSE).
- (U) Conduct joint Air Force/Army OT&E.
- (U) Award contract for LRIP Lot 4 (Navy, E-3, and E-8) production.
- (U) Accept delivery of LRIP Lot 2 (Navy and E-3) production terminals.

4. (U) Program to Completion:
   - (U) Complete final retarget of all software to Common Central Processing Unit (CPU).
   - (U) Complete activation of hardware depots, centralized software support activity (CSSA) and Interface Software Support Activities (ISSA).
   - (U) Complete retrofit of all terminals with Product Improvement hardware and software.
   - (U) Add time slot reallocation (TSR) function to common Network Interface Computer Program.
   - (U) Award First Full Rate Production Contract for Navy, E-3, E-8, and Army terminals.
   - (U) Accept delivery of LRIP Lot 3 & 4 production terminals.

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; and MITRE Corporation (system engineering support), Bedford, MA.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

NARATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Deleted integration efforts for F-15.

2. (U) SCHEDULE CHANGES:
   Accelerated integration of JTIDS into ABCCC to FY 1991.
   P3I contract award deferred from FY 1993 to FY 1994.
   Start ISSA activation in FY 1992. ILSE development slipped to FY 1992 to take advantage of emerging commercial support equipment technology.

3. (U) COST CHANGES: Major Contracts funding reduced because of schedule changes.

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, 3 July 1990.
- (U) Multiple Required Operational Capability (MROC) MJCS-194-89, 16 August 1989.
- (U) JTIDS Program Baseline, 10 July 1991.
- (U) Acquisition Decision Memorandum as ammended, 11 October 1990.

Program Element: #0604754F Project Number: P771
PE Title: Joint Tactical Information Distribution System (JTIDS) Budget Activity: #4-Tactical Programs

- (U) System Operational Requirements Document (SORD), TAF-306-74-I/II/III-A, 17 December 1990.
- (U) Test and Evaluation Master Plan (TEMP), 13 Nov 90.

G. (U) RELATED ACTIVITIES:
- (U) Program Element #27518F Joint STARS (E-8)
- (U) Program Element #27417F AWACS (E-3)
- (U) Program Element #27412F Tactical Air Control System-MCE (TACS-MCE)
- (U) Program Element #27419F ABCCC
- (U) Program Element #27418F Mobile Tactical Command and Control (MTACC)
- (U) Joint Program Designator (JPD) to be determined at Milestone IIIB.
- (U) There is no unnecessary duplication of effort within the Air Force or Department of Defense.

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

- (U) Aircraft Procurement, AF E-3 (BA 05 Modifications/BA 06 Aircraft Spares and Repair Parts):

| | FY 1991 ACTUAL | FY 1992 ESTIMATE | FY 1993 ESTIMATE | To Complete | Total PROGRAM |
|---|---|---|---|---|---|
| Cost | 0 | 0 | 22,400 | Cont. | TBD |

- (U) Aircraft Procurement, AF JSTARS (BA 06 Aircraft Spares and Repair Parts):

| | FY 1991 ACTUAL | FY 1992 ESTIMATE | FY 1993 ESTIMATE | To Complete | Total PROGRAM |
|---|---|---|---|---|---|
| Cost | 0 | 0 | 5,600 | Cont. | TBD |

- (U) MILITARY CONSTRUCTION: Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: A Memorandum of Understanding (MOU) between the UK and US Government is in effect and under review by the UK and US Government. The UK is purchasing JTIDS terminals both through direct commercial contract and through FMS procedures.

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 | Sucessfully supported Lot 2 Exit criteria |
| Post DAB phase 1 DT/OT | 9/90 | Sucessfully exchanged position and surveillance data between AF & Navy platforms. |
| Army 2M Tech. test | 6/90 - 3/91 | Completed 2M terminal technical testing |

Program Element: #0604754F
PE Title: Joint Tactical Information Distribution System (JTIDS)
Project Number: P771
Budget Activity: #4-Tactical Programs

| | | |
|---|---|---|
| Navy DT-IIE | 6/91 - 2/92 | Started Navy testing to support Lot 3 exit criteria |

T&E ACTIVITY (TO COMPLETION)

| Event | Planned Date | Remarks |
|---|---|---|
| Joint AF/Navy OT&E #1 | 2/92 - 3/92 | Multi-service testing required to support Lot 3 Exit Criteria - will involve 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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2880 4950th Test Wing (4950TW) | 190 | 3011 | 3,608 | Cont | TBD |
| 3120 Air Force Development Test Center (AFDTC) | 6,156 | 13,997 | 18,742 | Cont | TBD |
| 3285 Arnold Engineering Development Center (AEDC) | 3,192 | 7,397 | 12,082 | Cont | TBD |
| 3323 Cruise Missile Mission Control Aircraft (CMMCA) | 10,135 | 1,657 | 0 | 0 | 52,576 |
| 3324 HAVE LINK | 993 | 687 | 837 | Cont | TBD |
| 3620 Air Force Flight Test Center (AFFTC) | 14,554 | 19,222 | 18,831 | Cont | TBD |
| Total | 35,220 | 45,971 | 54,100 | Cont | TBD |

NOTE: This is one of several Air Force Test Infrastructure accounts which provides direct support to the DOD test mission. The aggregate FY 93 budget for these accounts reflects a significant negative real growth since 1968. As a result, weapon system 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 ensures the Department of Defense (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 four MRTFBs (4950TW, AEDC, AFFTC, and AFDTC). The fluctuations in the funding at these locations are the result of changing priorities in the improvement and modernization requirements. Further, each specific project has it's own planning, development, equipment acquisition/facility construction, installation, and checkout phases which often cause significant changes in funding from one year to the next. As such, the changes in funding from year to year do not necessarily indicate program growth but rather a planned phasing of improvement and modernization efforts. The test capabilities at these centers 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 four test centers have over $10B worth of unique test facility/capabilities. They are a national asset operated and maintained by the Air Force 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 A.F., other DOD agencies, and NASA. Staging out of U.S. and overseas bases, the Advanced Range Instrumentation Aircraft (ARIA) provide telemetry support for NASA and DOD missile launches. The Cruise Missile Mission Control Aircraft (CMMCA)

Program Element: #0604755F Budget Activity: #6 - Defense-wide Mission Support
PE Title: Improved Capability for DT&E

will support cruise missile testing. The CMMCA project funds development of critcal Software Development System (SDS) and Interim Contractor Support (ICS) necessary for initial maintenance of CMMCA aircraft. The 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. The IDF enables secure data processing and software modifications necessary for conduct of ARIA, CMMCA, and the Advanced Radar Test Bed (ARTB) missions. ARIA Scoring Systems aircraft modification, which includes the Sonobouy Missile Impact Location System (SMILS), an optical tracking system, and the Meteorological Evaluation Test System (METS), will enable accuracy measurements of DOD missile launches as well as precise determination of reentry vehicle impact position/time during ballistic missile testing.

(U) FY 1991 Accomplishments:
- (U) Completed Advanced Range Instrumentation Aircraft (ARIA) Scoring Systems aircraft flight testing from FY 90. ($0.2M)
- (U) Completed Integrated Data Facility (IDF) upgrade effort. ($1.0M FY90)
- (U) Deferred Interim Contractor Support (ICS) purchase as a result of contractor problems.

(U) FY 1992 Planned Program:
- (U) Continue IDF program with the real time test data monitoring module. Classified processing vault and Local Area Network becoming operational. Update of the telemetry system with encryption capability. ($3.0M)
- (U) ARIA Scoring System aircraft IOC.

(U) FY 1993 Planned Program:
- (U) Continue the Computational Analysis Module portion of the IDF program (IOC FY 94). ($3.6M)

(U) Work Performed By: Chrysler Technologies Airborne Systems, Inc, WACO TX.

(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 Mission 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 flight conditions. The 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.

(U) FY 1991 Accomplishments:
- (U) First aircraft (#895) structural flight test completed.
- (U) Mission equipment installed in aircraft (#893) and

Program Element: #0604755F Budget Activity: #6 - Defense-wide Mission Support
PE Title: Improved Capability for DT&E

ground test of equipment completed.
- (U) Purchased computer-automated-drafting tapes. ($.385M)

(U) FY 1992 and 1993 Planned Program:
- (U) FY 92 funding ($1.645M) required as a result of FY 91 funding cut for flight test and contractor line items.
- (U) First system flight test. (FY 92).
- (U) Deliver aircraft (#893) in FY 92 and install mission equipment in aircraft (#895) in FY 92.
- (U) System flight test of second aircraft (#895) in FY 93.
- (U) Deliver aircraft #895 (FOC) in FY 93.

(U) Work Performed By: Chrysler Technologies Airborne Inc., WACO, TX.

(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 1991 Accomplishments:
- (U) 4950th Test Wing: Purchased balance of UHF SATCOM Secure Voice equipment for ARIA Secure SATCOM project, including equipment for the Telemetry Simulation (TELSIM) office. Completed purchase of components for IDF secure enclosures. Completed design and began construction on Bldg 4010 Secure Room. Purchased telemetry encryption equipment for TELSIM. ($0.35M)
- (U) AFFTC: Procured range encryption support equipment (Time-Space-Position-Information (TSPI) Red Switch). ($0.6M)

(U) FY 1992 Planned Program:
- (U) AEDC: Continue development of UDCN with installations in fourth satellite building. ($0.1M)
- (U) AFDTC: Procure additional encryption devices for microwave systems. ($0.3M)
- (U) AFFTC: Continue network security upgrade, land radio procurement, and range telemetry upgrade. ($0.3M)

(U) FY 1993 Planned Program:
- (U) 4950th Test Wing: Continue installations of UHF Secure SATCOM equipment on ARIAs. ARIA Intrusion Detection system begins. ($0.8M)

(U) Worked Performed By: Digital Equipment Corporation, Pittsburgh, PA; Motorola, Inc. Scottsdale, AZ; Dorne & Margolin, Inc., Bohemia, NY; M otronics LA, CA; Andrew Corp., Orland Park, IL; various GSA vendors; and AFFTC, AEDC, and AFDTC in-house resources.

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PE Title: Improved Capability for DT&E

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.

Program Element: #0604755F
PE Title: Improved Capability for DT&E

Budget Activity: #6 - Defense-wide Mission Support

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

| Project Title<br>Popular Name | FY 1991<br>Actual | FY 1992<br>Estimate | FY 1993<br>Estimate | To<br>Complete | Total<br>Program |
|---|---|---|---|---|---|
| Arnold Engineering Development Center(AEDC) | 3,192 | 7,397 | 12,082 | 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 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 Engine Test Cell modification 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 the closed DELCO facility, by upgrading existing capabilities. C-Cell Data Acquisition System provides processing capability needed for advanced turbine engine testing on programs like the F-22 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 is projected to be 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 1991 Accomplishments:
   - (U) Provided J-6 project technical and management oversight for AEDC construction, technical support to construction contractor, Management Information System (MIS) operations and maintenance, and base support services. ($1.4M)
   - (U) Completed Test Cell T-3 modification. ($0.5M)
   - (U) Improved Ballistic Range project design completed and equipment acquisition initiated. ($1.3M)

2. (U) FY 1992 Planned Program:
   - (U) Continue J-6 project support in technical and management oversight of AEDC construction, technical support to construction contractor, base support services, MIS operations and maintenance, and review of activation/validation resource requirements. ($1.4M)
   - (U) C-Cell Data Acquisition System initiated with planning acquisition of initial work stations. ($0.3M)
   - (U) Begin TUSS project with control systems acquisition and installation in jet engine test cell. ($0.8M)
   - (U) Continue Improved Ballistic Range project upgrade with equipment acquisition and fabrication of new launchers. ($5.0M

3. (U) FY 1993 Planned Program:
   - (U) Continue J-6 project support in technical and management

Program Element: #0604755F
PE Title: Improved Capability for DT&E
Budget Activity: #6 - Defense-wide Mission Support

oversight of AEDC construction, technical support to construction contractor, base support services, and MIS operations and maintenance. Additionally activation/validation planning will begin and site activation will start leading to IOC in FY 95. ($3.4M)

- (U) Continue C-Cell Data Acquisition System with acquisition and installation of additional work stations and processors. ($3.8M)
- (U) Continue TUSS project with control systems acquisition and installation in wind tunnel. ($1.3M)
- (U) Continue Improved Ballistic Range project upgrade with fabrication and initial installation of equipment leading to IOC in FY 93. ($3.6M)

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

D. (U) WORK PERFORMED BY: Calspan Field Services, Inc., Buffalo, NY and AEDC in-house resources.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: Not Applicable.
2. (U) Schedule Changes: Not Applicable.
3. (U) Cost Changes: Congress reduced funding for this program in FY92 causing schedule delays and increased costs. Improved Ballistic Range funding increased in FY 92 and FY 93 for IOC in FY 93.

F. (U) PROGRAM DOCUMENTATION: PMD 2164(5)/0604755F, Improved Capability for DT&E.

G. (U) RELATED ACTIVITIES:
(U) PE 0604940D, Test Instrumentation Development.
(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 | 80.0 | 0 | 0 | 176 |

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

J. (U) MILESTONE SCHEDULE: This is a continuing project.

Program Element: #0604755F
PE Title: Improved Capability for DT&E

Budget Activity: #6 - Defense-wide Mission Support

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

| Project Title<br>Popular Name | FY 1991<br>Actual | FY 1992<br>Estimate | FY 1993<br>Estimate | To<br>Complete | Total<br>Program |
|---|---|---|---|---|---|
| Air Force Development Test Center (AFDTC) | 6,156 | 13,997 | 18,742 | 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 nonnuclear 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 infrared (IR), millimeter wave (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. GPS Range Systems will provide a major improvement for Time-Space-Position-Information (TSPI) on the Eglin ranges. 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 1991 Accomplishments:
   - (U) PRIMES funding provided a microwave environment generator and a transportable signal simulator. ($1.5M)
   - (U) GWEF funding provided a capability for hardware-in-the-loop simulation of MMW guided weapons against tactical targets. A study was performed defining interface between GWEF and PRIMES. ($1.2M)
   - (U) Airborne Test Instrumentation funding procured standard aircraft instrumentation kits to support SEEK EAGLE Stores Certification. ($0.4M)
   - (U) Seeker T&E funding completed the multispectral tower system and a quick-look data support system. Started integration of new IR imaging system. ($1.3M)
   - (U) ASTE Range Systems funding upgraded the high-speed video, range photo-optics, and electro-optical equipment with emphasis on cinetheodolite upgrades. ($0.8M)
   - (U) EMTE Range Systems funding procured instrumentation upgrades for threat simulators. ($0.1M)
   - (U) Mission Control/Data Analysis funding procured real-time display systems for mission control consoles. ($0.8M)

Program Element: #0604755F Budget Activity: #6 - Defense-wide Mission Support
PE Title: Improved Capability for DT&E

- (U) The interim upgrade to the Climatic Test Facility was completed keeping facility operating until major refurbishment is completed in FY 94. Instrumentation and data equipment upgrade program began. ($0.3M)

2. (U) FY 1992 Planned Program:
   - (U) An ECM Generator System and a fiber optic distribution network along with supporting instrumentation will be procured for PRIMES. ($1.6M)
   - (U) The MMW Simulator System in the GWEF will be completed. A multispectal test area and the fiber-optic link between GWEF and PRIMES will begin initial operation. ($1.0M)
   - (U) Standardized Aircraft Instrumentation (SAI) kits will be procured along with instrumentation pod development for Airborne Test Instrumentation. ($1.5M)
   - (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. ($2.6M)
   - (U) ASTE Range Systems continues upgrading data collection systems with emphasis on gun ranges, microwave towers, range telemetry and cinetheodolites. ($2.6M)
   - (U) EMTE Range Systems will begin initial procurement of the Scanning Transient Pulse Measurement System and continue EMTE instrumentation upgrades. ($0.9M)
   - (U) Mission Control/Data Analysis project will provide data analysis equipment to perform real-time operational and post-mission data processing. ($2.1M)
   - (U) GPS Range Systems will procure airborne transponders/receivers to interface with on-board GPS hardware and begin software development. ($0.8M)
   - (U) Upgrades to the Climatic Test Facility continues with the procurement of a fiber-optics data system. ($0.5M)

3. (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 multispectral test area interconnect and begin development of an IR scene generator. ($1.6M)
   - (U) Airborne Test Instrumentation will continue procurement of equipment and begin modifying three test aircraft per year with the SAI kits. ($3.2M)
   - (U) Seeker T&E will begin modification of the Calibrated Airborne Spatial Measurement System (CASMS) and procurement of weather instrumentation. ($2.6M)
   - (U) ASTE Range Systems will continue upgrading cinetheodolites, microwave towers, and range telemetry. ($2.8M)
   - (U) EMTE Range Systems will continue procurement of the Scanning Transient Pulse Measurement System, continue EMTE instrumentation upgrades, and begin equipment installation. ($2.9M)
   - (U) Mission Control will complete the real-time test support capability and will begin procurement of system for process and display of information in the classified mission areas. ($2.0M)
   - (U) GPS Range Systems will procure test sets, additional RAJPO pods, flightline ground stations and continue software development. ($0.9M)

Program Element: #0604755F
PE Title: Improved Capability for DT&E

Budget Activity: #6 - Defense-wide Mission Support

- (U) Additional telemetry data systems will be acquired for the Climatic Test Facility along with climatic simulation equipment. ($0.6M)

4. (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 1992 DESCRIPTIONS SUMMARY:
1. (U) Technical Changes: Not Applicable.
2. (U) Schedule Changes: Not Applicable.
3. (U) Cost Changes: Congress reduced funding during review of the FY91 budget resulting in further schedule delays and increased FY92 costs. FY 92 funding was reduced $2.8M.

F. (U) PROGRAM DOCUMENTATION: PMD 2164(5)/0604755F Improved Capability for DT&E.

G. (U) RELATED ACTIVITIES:
(U) PE 0604940D, Test Instrumentation Development.
(U) PE 0605735F, 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
PE Title: Improved Capability for DT&E

Budget Activity: #6 - Defense-wide Mission Support

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

| Project Title Popular Name | FY 1991 Actual | FY 1992 Actual | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Air Force Flight Test Center (AFFTC) | 14,554 | 19,222 | 18,831 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The AFFTC, located at Edwards AFB, conducts and supports developmental 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. Reentry support and engineering evaluation is provided to the Space Shuttle program and other transatmospheric vehicles. AFFTC operates the Air Force Test Pilot School (AFTPS). As a result of Defense Management Review (DMR) reductions, F-4 support aircraft are being replaced with F-16 test support aircraft. The Support Fleet Upgrade project instruments these aircraft for use as test support fleet aircraft enabling uninterrupted support during this transition. The Avionics Test and Integration Complex (ATIC) will allow ground testing of advanced aircraft's integrated network, including all flight control features as well as avionics. The R-2508 upgrade alleviates a safety of flight problem in the range complex. This is a joint Air Force/Navy project to increase the radar coverage on the range, reducing the probability of mid-air collision. Integrated Flight Data Processing System (IFDAPS) is a distributed processing system for Time-Space-Positioning-Information (TSPI) and telemetry engineering unit data. Advanced Data Acquisition and Processing System (ADAPS) will provide improved access to test data both in real time and post test, and build upon the existing IFDAPS capability. AFFTC Range Instrumentation Upgrade project, Digital Switch, will provide an automated ,digital switching capability and communication equipment. Advanced Range Data System (ARDS) is a highly accurate TSPI data and communications system which takes advantage of the Global Positioning System (GPS). Edwards Local Range Network (ELRAN) will provide AFFTC with a secure data communications network. Test and Evaluation Mission Simulator (TEMS) upgrade will equip simulators with advanced computers and visual systems to satisfy latest aircraft technology simulation requirements. Airborne Test Instrumentation System (ATIS) provides upgrades to current airborne instrumentation until Common Airborne Instrumentation System (CAIS) in developed and available. Common Airborne Instrumentation System (CAIS) will provide a high data rate, secure common (OSD developed) airborne instrumentation system and telemetry that is tailorable to a variety of aircraft. Computer aided engineering/manufacturing (CAE/CAM) will provide an integration of mechanical engineering, electronic engineering, analysis, simulation, and drafting to the interactive design requirements of test programs. Avionics Test Bay Systems (ATBS) upgrade provides new generic spread-bench capabilities to ground test integrated, advanced avionics systems. The Scientific and Engineering Computer Acquisition Project (SECAP) provides AFFTC systems integration to the new scientific and engineering mainframe computers acquired for advanced acquisition and data processing. Automated Test Data Management System (ATDMS) will provide the computer hardware, software, peripherals, and integration required to automate the management of mission test data from test inception to post test processing. 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.

Program Element: #0604755F
PE Title: Improved Capability for DT&E

Budget Activity: #6 - Defense-wide Mission Support

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Support Fleet Instrumentation Upgrade started to modify F-16 aircraft to replace retiring F-4s. ($2.9M)
   - (U) Completed ATIC upgrades. ($0.2M)
   - (U) R-2508 Upgrade began with acquisition of new processors and radar consoles to handle increased range coverage. ($1.8M)
   - (U) Installation/checkout of IFDAPS upgrades continued and initial design of the next generation Advanced Data Acquisition and Processing System (ADAPS) began. ($1.4M)
   - (U) AFFTC Range Instrumentation Upgrade (digital switch) completed communication hardware for two control rooms and continued telemetry antenna upgrades. ($1.5M)
   - (U) Acquisition and integration of ARDS equipment continued thus improving the processing and TSPI capability. ($5.5M)
   - (U) Electronic Combat Integrated Test (ECIT) design effort began. ($2.8M)

2. (U) FY 1992 Planned Program:
   - (U) Continue R-2508 upgrade equipment purchase. ($2.1)
   - (U) Continue Range Upgrade (digital switch) delivery and integration of hardware for additional control rooms. ($3.7M)
   - (U) Continue activation testing of ARDS central preprocessor with prototype RAJPO hardware. Start procurement of advanced TSPI. ($3.0M)
   - (U) Begin acquisition planning system design and prepare planning documents for the Edwards Local Range Network. ($0.4)
   - (U) Continue development of ADAPS and ATDMS by evaluating prototype systems and initial acquisition. ($2.6M)
   - (U) Continue TEMS training and software upgrades for FOC. ($1.6M)
   - (U) Begin Airborne Test Instrumentation System (ATIS) software development and development supplemental signal conditioning module. ($2.2).
   - (U) Accomplish CAE/CAM source selection and provide 3D manufacturing capability. ($0.3)
   - (U) Begin ATBS installation, continue software adaptation and procurement actions. ($2.4M)
   - (U) Begin SECAP efforts. ($1.1M)

3. (U) FY 1993 Planned Program:
   - (U) Continue Range Upgrade with final procurement of hardware, installation, and checkout in control rooms. ($2.0M)
   - (U) Complete ARDS central processor integration, delivery and checkout of first RAJPO production GPS equipment, and continuation of advanced TSPI upgrades. Develop specifications for mobile processor. ($5.0M)
   - (U) Continue Edwards Local Range Network development with further expansion of base fiber network to interconnect additional test activities. ($1.4M)
   - (U) Continue development of ADAPS and ATDMS by evaluating prototype systems and initial acquisition. ($4.7M)
   - (U) Continue TEMS training and installation. ($0.8M)
   - (U) Continue ATIS upgrade and upgrades large/small transport aircraft ground support systems. ($1.0M)
   - (U) Procure CAE/CAM integrated mechanical and electronic design, analysis, drafting, and documentation capabilities. ($2.0M)
   - (U) CAIS initial integration planning and support in preparation for first test units. ($0.3M)

Program Element: #0604755F
PE Title: Improved Capability for DT&E
Budget Activity: #6 - Defense-wide Mission Support

- (U) Continue ATBS equipment and software upgrade. ($1.6M)
- (U) SECAP first system IOC. ($0.2M)

4. (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); Ball Systems Engineering Services, San Diego, CA (Advanced Range Data System); Scientific Applications International Corp.; Los Angeles, CA; Data General Corp.; Irvine, CA; and AFFTC in-house resources.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

1. (U) Technical Changes: Congress directed that no funds be applied to the ECIT for FY 92. This resulted in a reprioritization of other programs in both FY 92 and FY 93.
2. (U) Schedule Changes: Not applicable
3. (U) Cost Changes: Congress reduced funding during review of FY 92 budget resulting in cuts to ECIT in FY 92 and reprioritization of programs. The FY 93 program has been reprioritized accordingly.

F. (U) PROGRAM DOCUMENTATION: PMD 2164(5)/0604755F Improved Capability for DT&E.

G. (U) RELATED ACTIVITIES:
(U) PE 0604940D, Test Instrumentation Development.
(U) PE 0605735F, 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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 2037 SLAR Sensors | 4,060 | 0 | 4,100 | Cont | TBD |
| Total | 4,060 | 0 | 4,100 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: The program objectives are to[ ]and the rapid transmission into operational systems. The approach draws upon existing technologies developed by other intelligence organizations, government agencies, laboratories and industry. Additional program information is contained in the SENIOR YEAR Special Access Program (SAP) report.

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

1. (U) Project 2037, SLAR Sensors: [ ]

FY 1991 Accomplishments:
- (U) Conducted comprehensive user requirements review to focus identification of high value technologies.
- (U) Designed modifications for the Airborne Synthetic Aperture Radar System (ASARS)[ ]technology.
- (U) Initiated design work to tailor SLAR exploitation techniques [ ]for ASARS-capable systems.

FY 1992 Planned Program:
- (U) FY92 appropriations conference zeroed SLAR funding. Program is executable through FY92 using remaining FY91 funds. However, the FY92 congressional action reduces the program's planned technology demonstrations from eight to two.
- (U) Conduct two technology demonstrations for user consideration and rapid transition to operational systems.
- (U) Continue to[ ]

Program Element: #0604756F Budget Activity:#4 -Tactical Programs
PE Tiltle: SIDE LOOKING AIRBORNE RADAR (SLAR)

FY 1993 Planned Program:
- (U) Continue to

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- (U) Develop transition plans and publish design specifications for technologies selected to transition to operational systems.
- (U) Conduct six to ten technology demonstrations for user consideration and rapid transition to operational systems.
- (U) Complete advanced Airborne Synthetic Aperture Radar System studies.

(U) Work Performed By: Demonstrations are performed by multiple contractors, universities, and government laboratories.

Related Activities
- (U) Program element #0301317F, SENIOR YEAR 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: Funds SLAR/SAR working group sharing unclassified radar concepts with NATO allies, other services, and US industries.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: 0604770F
PE Title: Joint STARS

Budget Activity: #4 - Tactical Programs

Project Title: N/A

POPULAR NAME: Joint STARS

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

| BUDGET (000) | FY 1991 | FY 1992 | FY 1993 | (TO COMPLETE) |
|---|---|---|---|---|
| Major Contract | 180.828 | 253.259 | 297.900 | 258.200 |
| Support Contract | 20.350 | 28.900 | 28.800 | 130.100 |
| In-House Support | 6.950 | 11.450 | 11.700 | 39.400 |
| GFE/ Other | 8.000 | 17.650 | 17.500 | 76.200 |
| TOTAL | 216.128 | 311.259 | 355.900 | 503.900 |
| SCHEDULE | FY 1991 | FY 1992 | FY 1993 | (TO COMPLETE) |
| Program Milestones | | SLPV Start 10FY92 | DAB IIIA 20FY93 | DAB IIIB 40FY95 |
| Engineering Milestones | | | | |
| T&E Milestones | Comb Govt DT/IOT&E Start4QFY91 | | | DT/MOT&E Complete 3QFY95 |
| Contract Milestones | Fol-on FSD Contr. Award 1QFY91 | Prod. Adv. Procurement 2QFY92 | | |

Program Element: 0604770F · Budget Activity: #4 - Tactical Programs
PE Title: Joint STARS

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; 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 1991 Accomplishments:
   - (U) System Level Performance Evaluation (SLPE) conducted (Sep 91 - Nov 91) to certify exit criteria for Advance Buy.
   - (U) Government DT/IOT&E commenced.
   - (U) Follow-on FSD contract awarded Nov 2, 1990.
   - (U) Nonrecurring engineering, refurbishment, and modifications to the production-representative aircraft continued.
   - (U) Joint STARS successfully supported Desert Storm.

2. (U) FY 1992 Planned Program:
   - (U) Advanced procurement decision will be made and contract awarded.
   - (U) Increased nonrecurring engineering and modification work on the production-representative aircraft continue.
   - (U) Government DT/IOT&E will continue.
   - (U) System Level Performance Verification (SLPV) will be conducted in preparation for Milestone IIIA.
   - (U) Construction of MOB facilities will start.

3. (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 be awarded.
   - (U) Engineering and Manufacturing Development (EMD) contract for the Self Defense Suite (SDS) will be awarded.
   - (U) Construction of MOB facilities will continue.
   - (U) Contract will be awarded for Ground Support Systems.

Program Element: 0604770F Budget Activity: #4 - Tactical Programs
Title: Joint STARS

4. (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
   - (U) FOB construction

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 at Ft Monmouth NJ.

E. (U) COMPARISON WITH FY 1992 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: A System Level Performance Evaluation (SLPE), performed by the Government, was conducted due to the delay to the System Level Performance Verification (SLPV), from 3Q FY91 to 1Q FY92, caused by Desert Storm. This provided the necessary data to support the advanced procurement exit criteria. The deployment to Desert Storm impacted the development program by 8-10 months.

3. (U) COST CHANGES: MILCON costs have increased by $58M due to final identification of the MOB and costs associated with that decision. $39M was approved in the Desert Storm supplemental to cover FY91 Desert Storm costs. Only $9.9M of FY92 Desert Storm costs, to cover contractor impacts, has been funded. Working towards resolution without further impacts to the program. Beginning in FY93 RDT&E funding for the SDS ($49.5M/FY93, $41M/to complete), previously budgeted in the Electronic Warfare PE, will now be reflected in the Joint STARS RDT&E PE.

F. (U) PROGRAM DOCUMENTATION:

| | | |
|---|---|---|
| - (U) | TAF SON 309-82 (S) | Jun 82 |
| - (U) | USAF/USA MOU | Apr 85 |
| - (U) | JSORD (S) | Dec 90 |
| - (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 |
| - (U) | PMD 6027(21) | Jul 91 |

- (U) PE 0603790D, Joint STARS NATO Cooperative Development Project.
- (U) PE 0604770A, The Army RDT&E Joint STARS Program.

Program Element: 0604770F Budget Activity: #4 - Tactical Programs
PE Title: Joint STARS

G. (U) RELATED ACTIVITIES:

- (U) The Army Joint STARS Ground Station Module procurement is funded under Army Other Procurement Program.
- (U) PE 0604270F, Electronic Warfare, contains $30.5 million of FY92 RDT&E funds to initiate the development of the Self-Defense Suite for the E-8 aircraft. Beginning in FY93 RDT&E funding for the SDS will be contained in the Joint STARS PE 0604770F.
- (U) PEs 0603770F and 0604770F/0604770D replace PEs 0603747F and 0604616F, Pave Mover.
- (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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 1. (U) Procurement: PE 0207581F/(BA4 & BA6) | | | | | |
| Cost | 0 | 137261 | 387830 | 3987999 | 4513090 |
| Quantity | | | 1 | 18 | 19 |
| 2. (U) Military Construction: | 0 | 18800 | 0 | 157200 | 176000 |

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 were 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), which include: 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. The 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 were funded by Nunn Amendment funds. The SORPROS Study reports are in their final stages and report publication is pending consolidation of US/UK inputs. The final ARDS report was published on 10 Jun 91. The SIDL final report was published in May 91.

Program Element: 0604770F
PE Title: Joint STARS

Budget Activity: #4 - Tactical Programs

J. (U) TEST AND EVALUATION DATA:

T&E ACTIVITY (PAST 36 MONTHS)

| Event | Date | Results |
|---|---|---|
| Contractor DT&E | 4Q FY88 - 4Q FY91 | Successful flight tests accomplished |
| Government SLPE | 4Q FY91 - 1Q FY92 | Advance buy exit criteria successfully evaluated |

| Event | Planned Date | Remarks |
|---|---|---|
| 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 |
| SDS Block II | 3Q FY96 - 3Q FY97 | DT&E |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| NONE Joint Interoperability of Tactical Command and Control Systems (JINTACCS) | 4,437 | 5,081 | 7,100 | 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 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 C3 systems interoperability among all the CINCs, DoD agencies, and the services.

(U) FY 1991 Accomplishments:
- (U) Fielded a prototype version of the generic MTF parser (Phase 2).
- (U) Completed Joint Interoperability Test Center (JITC) recertification testing for Joint Automated Message Preparation System (JAMPS).
- (U) Continued development of capability to generate U.S. message text formats (USMTFs) from data base.
- (U) Continued development of TADIL-J capability.
- (U) Continued development of architecture to implement integrated data element structures into all C3I systems.
- (U) Initiated equipment acquisition for E-3 Operational Facility (OPFAC) testbed for TADIL-J testing.

Program Element: #0604779F Budget Activity: #4 - Tactical Programs
PE Title: Joint Interoperability of Tactical Command and Control Systems (JINTACCS)

(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 equipment acquisition for Airborne Battlefield Command and Control Center (ABCCC) OPFAC into the Air Force testbed for TADIL-J testing.
- (U) Begin equipment acquisition for Modular Tactical Air Command and Control (MTACC) OPFAC into the Air Force testbed for TADIL-J testing.
- (U) Expand MTF certification testing to operational systems.
- (U) Continue advanced message text formats (MTF) message preparation and processing software development.
- (U) Continue integration of MTF parser into Wing Command and Control System (WCCS) and Contingency Tactical Automated Planning System (CTAPS).
- (U) Continue development of architecture to implement integrated data element structures into all C3I systems.

(U) FY 1993 Planned Program:
- (U) Continue advanced MTF message preparation and processing software development.
- (U) Begin implementation of rule changes to the MTF standard.
- (U) Continue development of TADIL-J capability.
- (U) Increase above FY 1992 is needed to support E-3: begin Air Force testing of TADIL-J in E-3 and start integration of E-3 OPFAC into Air Force testbed for TADIL-J testing.
- (U) Start integration of ABCCC OPFAC into Air Force testbed for TADIL-J testing.
- (U) Begin Air Force testing of the TADIL-J message standard.
- (U) Begin equipment acquisition for the JSTARS OPFAC for TADIL-J testing.

(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 demonstrations. The JINTACCS contractors are the COMPTEK Research, Inc., Buffalo, NY, and the MITRE Corporation, Bedford, MA.

(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, C3 Interoperability/Joint Tactical C3 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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605101F Budget Activity: #6-Defense-Wide Mission Support
PE Title: RAND, Project Air Force

A. (U) RESOURCES ($ In Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | FY 1994 Estimate | TO Complete | Total Program |
|---|---|---|---|---|---|---|
| XXXI RAND, Project AIR FORCE, | 24,771 | 22,488 * | 23,100 | 24,200 | Cont | TBD |
| Total | 24,771 | 22,488 * | 23,100 | 24,200 | 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 LESS THAN $10.0 MILLION IN BOTH FY 1992 AND FY 1993:

1. (U) XXXI, RAND, Project AIR FORCE:

(U) FY 1991 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 Desert Shield and Desert Storm Assessments; future security requirements for the Persian Gulf; a new perspective on nuclear proliferation; tactical stealth/counter stealth assessment; space support for terrestrial operations; bomber force mix study; investment strategies for future tactical air capabilities; mission planning requirements for advanced precision guided munitions; maintaining design capability for military aircraft; and enhancing the logistics requirements estimation process. Direct assistance included support to Air University war games; automated weaponeering methodology; and CRAF/C-17 options.

(U) FY 1992 Planned Program:

- (U) Research will continue on those topics identified as major issues by the Air Force Advisory Group. Specific research areas include base force integration; Desert Storm assessment; airpower in foreign internal defense; tactical stealth/counter stealth assessment; role of air delivered ordance in future military operations; insuring bomber flexibility in future conflicts; aircraft penetration

Program Element: #0651O1F Budget Activity: #6-Defense-Wide Mission Support
PE Title: RAND, Project Air Force

model development; recasting the strategic nuclear posture; assessing technology options; prioritizing space options; policy options for improving the contribution of the industrial base to USAF capabilities; improving the integration and responsiveness of multi-echelon spares and repairs management; and new business options for the USAF support system.

(U) FY 1993 Planned Program:
- (U) Specific new topics will evolve from the major issues established by the Air Force Advisory Group. Research will continue in those areas where Project AIR FORCE has developed special expertise and can make unique contributions to the Air Force. Major research efforts will likely focus on global and regional security trends; force structure and support issues; innovative resource management policies; investment strategies for future air combat aircraft and munitions; enhancing air combat models; and assessing technology opportunities to improve Air Force capabilities in key mision areas.

(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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 06TG 6585th Test Group Support | 20,755 | 21,747 | 23,278 | Cont | TBD |
| 2900 RATSCAT Upgrade | 200 | 2,000 | 2,000 | Cont | TBD |
| 688G Aircraft Navigation System Verification | 2,070 | 2,000 | 2,000 | Cont | TBD |
| Total | 23,025 | 25,747 | 27,278 | Cont | TBD |

NOTE: This is one of several Air Force Test Infrastructure accounts which provides direct support to the DOD test mission. The aggregate FY 93 budget for these accounts reflects a significant negative real growth 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 Department of Defense (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. The PE funds test infrastructure overhead support including: command and supervisory staffs; supply stocks; upkeep, refurbishment, repair, and replacement of worn 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. 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 sled 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.

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Budget Activity: #6 - Defense-wide Mission Support

(2) The CIGTF performs testing of DOD guidance systems, including performance and reliability verification of guidance systems and integrated navigational aids, such as Global Positioning System (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 Inertial Navigation Systems (GPS-aided); and provide the capability to test GPS user equipment. (3) The RATSCAT facility includes two separate, yet complementary 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 1991 Accomplishments:
- (U) Continued infrastructure overhead support for testing of CREST, F-22, B-2, Kinetic Energy Missile, ACES II, Peacekeeper, Rail Garrison, AGT, and numerous classified projects.
- (U) Procured new telemetry antenna system at the sled track to avoid frequency encroachment by civilian users.
- (U) Completed rail alignment survey at the sled track and developed statement of work for sled track alignment.
- (U) Demonstrated concept for live fire testing of full scale aircraft at sled track.
- (U) Continued preparation and management for testing of standard aircraft navigation systems/equipment and the Canadian Helicopter Integrated INS/GPS.
- (U) Procured laser ranging for automatic tracking system.
- (U) Supported testing of 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 sled track.

(U) FY 1992 Planned Program:
- (U) Continue level of infrastructure overhead test support for Peacekeeper, AGT, and numerous classified projects.
- (U) Initiate development of the ARS as an aircraft reference system to support future navigation systems testing.
- (U) Initiate infrastructure overhead test support for IR countermeasures.
- (U) Begin realignment of sled track deferred from FY91. ($0.7M)
- (U) Begin sled track test support for the ATF ejection seat, F-16 ejections with Night Vision Goggles, the Hypersonic Sled Test, the Army Theater Missile Defense (TMD), and

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PE Title: NAV/RADAR/SLED-TRACK
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several IRCM systems which support special operations.
- (U) Continue management infrastructure overhead support for sled track testing of the Army LOSAT and ADKEM, Peacekeeper Guidance system, CREST, and AGT.
- (U) Procure sled track S-Band telemetry data acquisition systems deferred from FY 91. ($0.4M )

(U) FY 1993 Planned Program:
- (U) Continue infrastructure test support for aircraft navigation systems and sled track support for B-1, B-52, Peacekeeper, AGT, Peacekeeper guidance system, CREST, Army TMD, and Japanese FSX ejection seat with inflation increase of $0.9M.
- (U) Continue to expand use of the ARS.
- (U) Continue infrastructure overhead test support for IR countermeasures.
- (U) Complete rail alignment at sled track deferred from FY 92.($0.2M)
- (U) Demonstrate Mach 10 hypervelocity capability on sled track.

(U) Work Performed By: In house 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 1991 Accomplishments:
- (U) Continued development, construction and testing of a large target positioning device. ($0.1M)
- (U) Initiated study to complete RATSCAT's engineering laboratory. ($0.1M)

(U) FY 1992 Planned Program:

- (U) Complete fabrication of heavy target mounting device shroud/skirt. ($0.9M).

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Budget Activity: #6 - Defense-wide Mission Support

- (U) Complete design for low frequency radar improvements at RAMS; procure risk reduction hardware. ($0.9M)
- (U) Initiate study and analysis of replacement for mobile bistatic radar vans ($0.2M)

(U) FY 1993 Planned Program:
- (U) Initiated wide-band radar acquisition. ($0.5M)
- (U) Complete installation of ultra wide-band radar. ($0.6M)
- (U) Award contract for bistatic replacement. ($0.8M)
- (U) Complete design and begin procurement for improved data acquisition and processing system. ($0.1M)

(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 1991 Accomplishments:
- (U) Continued testing of aircraft navigation systems and equipment, including GPS-aided and GPS User Equipment.
- (U) Completed Advanced Reference System (ARS) upgrade to the CIRIS.
- (U) Provided data analysis/test assessment for B-1 and Canadian Helicopter inertial systems.

(U) FY 1992 Planned Program:
- (U) Continue test support for aircraft navigation systems and equipment, including GPS-aided and GPS User Equipment (UE).
- (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.

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PE Title: NAV/RADAR/SLED-TRACK

Budget Activity: #6 - Defense-wide Mission Support

(U) FY 1993 Planned Program:
- (U) Continue test support for aircraft navigation systems and equipment, including GPS-aided INS and GPS User Equipment.
- (U) Continue direct test support of B-1 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 1993 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605712F
PE Title: Initial Operational Test and Evaluation (IOT&E)

Budget Activity: #6 - Defense-Wide Mission Support

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

| Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | TO Complete | TOTAL Program |
|---|---|---|---|---|---|
| Initial Operational Test and Evaluation | | | | | |
| PE TOTAL | 15,884 | 21,119 | 27,172 | Cont | TBD |

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 III). In addition, this PE will fund major Operational Utility Evaluations (OUEs) and Early Operational Assessments (EOAs) which support major milestones and decision points prior to Milestone III. 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 Decision 931, Single PE for IOT&E, approved for implementation in FY 91.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.M IN FY 1993:

(U) Initial Operational Test and Evaluation

(U) FY 1991 Accomplishments:

- (U) Efforts included Ballistic Missile Early Warning System (BMEWS) Radar Upgrade Site III, C-17, Communications System Segment Replacement (CSSR), NAVSTAR Global Positioning System (GPS) Space and Control Segments, Defense Support Program (DSP) Communications Network, Central PACBAR (Saipan radar), Joint Tactical Information Distribution System (JTIDS) Class 2 Terminal, Consolidated Space Operations Center (CSOC), DSP Cround Station (Non-Fix), Granite Sentry, Automated Remote Tracking Station (ARTS), Integration Correlation and Display System (ICADS) System, Cobra Dane System Modernization, Satellite Readout Station Upgrade, Cheyenne Mountain Upgrade (CMU), B-1B, F-111 Digital Flight Control System (DFCS), Over the Horizon Backscatter (OTH-B), Joint Surveillance Target Attack Radar System (JSTARS), Military Strategic and Tactical Relay (MILSTAR), Sensor Fused Weapon (CBU-97/B), CV-22A Osprey Aircraft, F-22, Aircrew Eye Respiratory Protection (AERP), Chemical Protective Equipment, Transportable BRAAT (Base Recovery After Attack) Communications System (TBCS), Rapid Runway Repair, Compass Call Project

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34, Transportable Collective Protection System (TCPS), Missile End Game Scoring System, GPS Range Applications, Dual Modem Upgrade (DMU) Phase, Short Range Attack Missile II (SRAM), Small Single Reentry Vehicle (RV), Intercontinental Ballistic Missile (ICBM), Mark XV IFF, Follow-On Tactical Recon System (FOTRS), Command and Control (C2) Information Processing System (IPS), Peacekeeper Rail Garrison (PKRG), Short Range Attack Missile-Tactical (SRAM-T), HARM Low Cost Seeker (Harm LCS), Commercial Microwave Landing System Avionics (CMLSA), Civil Reserve Air Fleet (CRAF) Aeromed Segment, Defense Meterological Satellite Program (DMSP)-Mark IV-B, F-15 Tactical Electronic Warning System (TEWS) ALQ-135 Band 1.5, F-16 ALE-47, Contingency Airfield Lighting System (CALS), US/Nato E-3 Strategic Electronic Suppression Measure (ESM) System, Mission Data Preparation System, Rapid Execution and Combat Targeting (REACT), High Power Transmit Set (HPTS), Multi-Place Life Rafts, Night Vision System, Strategic Training Route Complex (STRC)/Route Integration Instrumentation System (RIIS), Dual Frequency Minimum Essential Emergency Communication Network (MEECN) Receiver Portable (DFMRP), Water Activated Release Systems. Pacer Link, B-2, Survivable Communication Integration System (SCIS), Pave Paws Upgrade Program (PPUP), Space Defense Operations Center (SPADOC) 4-B.

- (U) Military Strategic and Tactical Relay (MILSTAR) Satellite: Completed a Multiservice System Operational Assessment to support the Navy satellite terminal full scale production decision. Completed the operational demonstrations of the SAC Airborne Command Post and Ground Command Post MILSTAR Terminals to support Fleet Modification and Fielding Decisions.
- (U) F-22: Completed the Early Operational Assessment and reported results to the Defense Acquisition Board 2. Performed as an advisor to the System Program Office during source selection. Developed initial IOT&E test concept and briefed USAF/TE and DOT&E.
- (U) Follow-On Tactical Reconnaissance System (FOTRS): Test team activated. FOTRS is a Joint Tactical Reconnaissance improvement effort which contains 3 projects: Unmanned Aerial Reconnaissance System (UARS), Joint Service Imagery Processing System (JSIPS), and F-14R/Advanced Tactical Air Reconnaissance System Common Sensor Suite (ACSS).
- (U) C-17: Test team activated in Dec 1990; first test conducted in Sep 1991.
- (U) NAVSTAR GPS: Due to programs slips, Space and Control Segment Phase II planning and test preparation continued.
- (U) Joint Surveillance and Target Attack Radar System (JSTARS): Operational Utility Evaluation (OUE) was conducted at General Dynamics, Ft Worth, Texas.
- (U) B-2: Focused on survivability modeling and simulation.

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(U) FY 1992 Planned Program:

- (U) Efforts include Civil Reserve Air Fleet (CRAF) MD-80, Commercial Microwave Landing System Avionics (CMLSA), Mobile MLS (MMLS), C2 IPS, Defense Meterological Satellite Program (DMSP) Mark IV-B Fixed Terminal, C-130 Liquid Crystal Display (LCD) Cockpit (RAMTIP), C-5/C-130/C-141 Airlift Defense System (ADS), Ballistic Missile Early Warning System (BMEWS) Radar Upgrade Site III, Communications System Segment Replacement (CSSR) Phase III, Survivable Communications Integration System (SCIS), Command Center Processing Display System Replacement (CCPDSR), AN/FPS-123 Pave Paws Upgrade Program (PPUP), System 1/Ground Computer Changeout (SYS 1/GCO), Satellite 14 Ground Station Upgrades, Automated Remote Tracking Station (ARTS) Phase II, ICADS Phase I, Cobra Dane System Modernization, Satellite Readout Station Upgrade (SRSU), Granite Sentry, Offutt Processing and Correlation Center (OPCC), Command and Control Center Upgrades (C2CU)/Mobile Command and Control System (MCCS), C2CU/Space Command Center (SPACC), Cheyenne Mountain Upgrade (CMU), Space Defense Operations Center (SPADOC) 4C, Missile End Game Scoring (MEGS) System, Airborne Electronic Counter Measure Threat Simulator (AETS), Aircrew Eye Respiratory Program (AERP), Transportable Base Recovery After Attack (BRAAT) Communication System (TBCS), Compass Call Project 34, ARM Decoys, Improved Data Link (IDL), Combat Edge, Have Quick IIA URC-126 Radios, F-15C TEWS, F-15E TEWS, F-16/ALE-47, CALS, US/NATO E-3 ESM, E-3 Block 30/35 Upgrade, Water Activated Mask Release System (WAMRS), Tower Restoral VehicleSurveillance Restoral Vehicle (TRV/SRV), Chemical Warfare Protective Equipment (CWPE), Dual Modem Upgrade (DMU) Phase II, Nuclear Mission Planning and Production System (NMPPS), Rapid Execution and Combat Targeting (REACT), E-4 High Power Transmit Set (HPTS), Active Noise Reduction/Thermal Flash Protection Devices (ANR/TFPD), Advanced Night Vision System (NVS), STRC/RIIS, Dual Frequency MEECN Receiver (DFMR)-Portable, DFMR in Minuteman Launch Control Centers (LCC), Water Activated Release Systems/Life Support Equipment, Pacer Link II Compatibility, E-4B Control Enhancement Mod Block III-B, C-17, NAVSTAR GPS Phase III, JTIDS MST-OT-I/II, CSOC MCC-1B, OTH-B, JSTARS, Survivable Defense Support Program (DSP-1), AF Mission Support System (AFMSS), MILSTAR Multi-service, SFW, B-1B Weapon System Trainer (WST), F-22/F-15 Compare, SRAM II, SICBM, FOTRS, PKRG, SRAM-T, Harm LCS, B-2, E-3 Radar System Improvement Program (RSIP), and Advanced Training System (ATS).
- (U) Automated Remote Tracking Station (ARTS) Phase II: On-going evaluation of ARTS ability to perform telemetry, tracking and command support for DOD and other Air Force Satellite Control Network (AFSCN) supported spacecraft.
- (U) Cobra Dane System Modernization: Planning and preparation for test of replacement computer, peripheral equipment and some of the radar signal processing transmitter-receiver equipment. Verify Automated Data Processing

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Equipment capacity and radar performance for the tactical warning, intelligence gathering, attack assessment and SPACETRACK.

- (U) Cheyenne Mountain Upgrade (CMU): Preparations for assessments, beginning FY93, on air defense, missile warning, and space defense. Tied integrally with the SCIS, CSSR, CCPDSR, SPADOC, Granite Sentry, and OPCC segments.
- (U) Missile End Game Scoring (MEGS): Combined DT&E/IOT&E begins. Evaluation of system use for air-to-air weapons system testing and evaluation. Flight testing will be conducted at Tyndall AFB and Holloman AFB, concurrent with operational Weapons Systems Evaluation Program (WSEP) missions.
- (U) Airborne Electronic Counter Measure Threat Simulator (AETS): Test execution and completion. AETS incorporates the DLQ-e modules of the DLQ-8 ECM pod currently used by the QF-106.
- (U) Joint E-3 ESM: Test execution and completion. A US/NATO E-3 Joint Test Force evaluation of ESM in a clear and ECM environment, with ground emitters from R-2915A/B and the EF-111.
- (U) Tower Restoral Vehicle/Surveillance Restoral Vehicle (TRV/SRV): Execution begins. TRV/SRV will provide continuous air traffic control services in the event of a primary facility loss or outage.
- (U) Strategic Training Route Complex (STRC)/Route Integration Instrumentation System (RIIS): Test of RIIS integration of the various ground and control systems communications/data nets and the capability to pass pertinent STRC mission data from sites to the Strategic Training Center.
- (U) C-17: Combined DT&E/IOT&E starts. Testing will include the low altitude parachute extraction system, delivering outsized equipment to austere airfields, and personnel and equipment airdrops.
- (U) Navstar Global Positioning System (GPS) Phase III: Planning and preparation for continued tests of NAVSTAR GPS radio navigation reference system space and ground segments. The satellite information is continually monitored and updated by a network of tracking, commanding and processing stations. Phase II tested space and ground control segment interoperability and the operational and maintenance capabilities of the system.
- (U) Joint Tactical Information Distribution System (JTIDS): Will conduct two-phased AF/Navy multiservice testing: MST-OT-I (Mar 92) and MST-OT-II (Jun 92). Will complete planning for AF/Army multiservice testing (FY93).
- (U) Joint Surveillance & Target Attack Radar System (JSTARS): Conclude OUE effort. Activate initial IOT&E test team at Melbourne Fl, and provide necessary equipment/supply support.
- (U) MILSTAR Multi-service: Start the multi-phased system level IOT&E. Evaluate the Army, Navy and AF terminals and the Mission Control Segment. Conduct a multi-service terminal interoperability demonstration.
- (U) B-1B Weapon System Trainer (WST): Planning and preparation on-going for FY 93 test of the WST capability to provide realistic aircrew training throughout a combat mission scenario.

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- (U) F-22: Planning for an Early Operational Assessment during the Engineering, Manufacturing and Development Phase to support the Low Rate Initial Production decision in 1996. Conduct a study to predict the outcome of the F15/F22 open air comparison.
- (U) Follow On Tactical Recon System (FOTRS): Assess JSIPS capability to read the imagery and put it on display. Start the RF-4C/ACSS Operational Assessment and the F-18/ACSS combined DT&E/IOT&E. Conduct an Early Operational Assessment on the UARS to assess program documentation and program progress.
- (U) B-2: Continue validation and accreditation of flight test capabilities and facility upgrades.
- (U) E-3 RSIP: Initiated the test planning phase of the program.
- (U) Advanced Training System (ATS): Preparation for test, starting in FY 93, of the ATS productivity enhancements to the ATC technical training activities through automation.

(U) FY 1993 Planned Program:

- (U) Efforts include Airlift Defense System (ADS), 60K Loader, UHF Satellite Terminal System (USTS), BMEWS Radar Upgrade Site III, CSSR Phase III, Survivable Communications Integration System (SCIS), Command Center Processing Display System Replacement (CCPDSR), System 1/Ground Computer Changeout (SYS1/GCO), Ground Station Update for Satellite 14, ARTS Phase II, Cobra Dane System Modernization, Satellite Readout Station Upgrade (SRSU), Granite Sentry, Offutt Processing and Correlation Center (OPCC), Command and Control Center Upgrades(C2CU)/Mobile Command and Control Systems (MCCS), C2CU/Space Command Center (SPACC), CMU, SPADOC 4C, MEGS, ARM Decoys, Improved Data Link (IDL), F-111 DFCS, QF-4, Advanced Support Equipment, F-15C TEWS, F-15E TEWS, F-16/ALE-47, E-3 Block 30/35 Upgrade, WAMRS, TRV/SRV, Chemical Warfare Protective Equipment, DMU Phase II, Nuclear Mission Planning and Production System (NMPPS), REACT, E-4 HPTS, Active Noise Reduction/ Thermal Flash Protection Devices (TFPD), Advanced Night Vision System (NVS), STRC/RIIS, Dual Frequency MEECN Receiver (DFMR)-Portable, DFMR in Minuteman Launch Control Centers, Pacer Link II, Water Activated Release Systems/Life Support Equipment, E-4B Communications Enhancement Mod Block III-B, Bomber Airborne Instrumentation System (BAIS), C-17, NAVSTAR GPS Phase III, JTIDS, CSOC, JSTARS, Survivable DSP-1, AF Mission Support System, MILSTAR, B-1B WST, F-22, FOTRS, B-2, E-3 RSIP, Multi-Mission Airborne Terminal (MMAT), and the Advanced Training System (ATS).
- (U) Granite Sentry: Test execution on-going.
- (U) Command and Control Center Upgrades (C2CU)/Space Command Center (SPACC): Test execution (Sep 93 start).
- (U) Cheyenne Mountain Upgrade (CMU): Test execution begins.
- (U) F- 11 Digital Flight Control System (DFCS): Test execution begins. Testing of the DFCS for providing pitch, roll, and yaw capabilities; stall inhibition;

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low altitude monitoring; landing configuration cautions; and feel and trim assembly in the F-111.

- (U) QF-4: Test planning, preparation, and test execution (start Jun 93). Testing enhanced drone capability over the current QF-106.
- (U) F-15C TEWS: Test execution begins and continues throughout FY.
- (U) F-15E TEWS: Execute test Nov 92 and complete Apr 93.
- (U) Rapid Execution and Combat Targeting (REACT): Test execution on-going.
- (U) C-17: Dedicated IOT&E to begin in May 1993.
- (U) Navstar Global Positioning System (GPS) Phase III: Execution (start Mar. 93).
- (U) Joint Tactical Information Distribution System (JTIDS): Continue execution of multiservice testing. Complete planning for AF/Army multiservice testing in Jan-Feb 93.
- (U) Consolidated Space Operations Center (CSOC): Program IOT&E scheduled Jan-Mar 93.
- (U) Joint Surveillance Target Attack Radar System (JSTARS): IOT&E test planning and execution.
- (U) B-1B Weapon System Trainer (B-1B WST): Last phase of IOT&E test set for Mar-Apr 93.
- (U) F-22: Observe/participate in Avionics Demonstration. Continue the F-15/F-22 comparison study assessment.
- (U) Follow-On Tactical Reconnaissance System (FOTRS): Start JSIPS *Multiservice OT&E with a full certification of an operable system.* Complete ACSS operational assessment and the Early Operational Assessment for the Unmanned Air Vehicle.
- (U) B-2: OT&E flight testing will start.

(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. Per AF/CV Msg 261200Z Dec 91, AFOTEC, starting Jun 92, will conduct all IOT&E and QOT&E testing. MAJCOM's will only conduct FOT&E tests except for those programs designated by higher headquarters for AFOTEC conduct. This will increase the number of tests AFOTEC is responsible to conduct for a current level of approximately 40 to an estimated level of 300.

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

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

(U) International Cooperative Agreements: Not Applicable.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 06RB Arnold Engineering Development Center (AEDC) | 144,209 | 157,917 | 177,788 | Cont | TBD |
| 06ZA Air Force Development Test Center (AFDTC) | 54,976 | 62,841 | 75,742 | Cont | TBD |
| 06YA Air Force Flight Test Center (AFFTC) | 63,568 | 73,846 | 84,682 | Cont | TBD |
| 06UC 4950th Test Wing (4950 TW) | 41,855 | 44,879 | 51,865 | Cont | TBD |
| 06DL Depot Level Reparables (DLR) | -0- | 31,134 | 33,749 | Cont | TBD |
| Total | 304,608 | 370,617 | 423,826 | Cont | TBD |

NOTE: This is one of several Air Force RDT&E Test Infrastructure accounts which provide direct support to the DOD test mission. The aggregate FY 93 budget for these accounts reflects a significant negative real growth since 1968. As a result, significant technology advancements have occurred during this time period without the corresponding 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 Department of Defense (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 environmental simulation chambers, armament test ranges, climatic test facilities, avionics test facilities, aircraft testbeds, dry lakebed landing sites, and instrumented test ranges. T&E Support funds test infrastructure overhead activities including: command and supervisory staffs; supply stocks; upkeep, refurbishment, repair, and replacement of worn 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. This program element experienced a significant increase in content starting in FY 92. These changes include the following: transfer of funds for depot level reparables, manpower realignment from O&M and MILPERS to RDT&E, conversion of military positions to civilian, transfer of funds to operate the Benefield Anechoic Chamber, new/increases to state taxes, funds to operate and maintain new test facilities coming on line, mandatory pay raises/award fee program increases, aircraft test support fleet modernization, test equipment/facility maintenance and repair, and inflation/fuel cost increases. These changes appear to reflect program growth; however, the changes are all based on programmatic increases resulting from content changes. The specific changes are described for each test location.

Program Element: #0605807F
PE Title: Test and Evaluation Support

Budget Activity: #6 - Defense-Wide Mission Support

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 facilities in the free world (includes transonic, supersonic, and hypersonic wind tunnels; rocket motor and turbine engine test cells; space environmental test chambers, hyperballistic ranges; and other specialized facilities). 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 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 civilian contractor. In order to provide the necessary technological/test expertise to weapon system test programs it is critical to maintain a core group of this work force. Together, these resources posture the Center to support aircraft; missile, and space systems test at simulated flight conditions; and fund a technology program to develop advanced testing techniques and instrumentation required to test tomorrow's aerospace systems. 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 F-22 Fighter; missiles such as the Patriot and the Tomahawk cruise missile; and space systems to include the Space Shuttle and the Global Positioning System (GPS) satellite.

(U) FY 1991 Accomplishments:
- (U) Provided test infrastructure overhead support for testing of programs such as the F-22, NASP, SRAM II, SDI, ASMS, AMRAAM, GBU-15, Minuteman, F-15, F100/110 engines, Space Shuttle, and classified projects.
- (U) Funded salaries of 159 civilian personnel and over 2,070 operating contractors, as well as all associated civilian labor expenses.
- (U) Desert Storm supplemental. ($0.4M)

(U) FY 1992 Planned Program:
- (U) Continue test infrastructure overhead support including a $4.0M increase to offset inflation from FY 91.
- (U) Fund 163 civilian personnel and 2,226 operating contractors, as well as civilian labor associated expenses. Fund mandatory pay raise for operating contractors. ($2.5M)
- (U) Provide funding for an increase in the award fee pool for the operating contractor. ($0.4M)
- (U) Provide additional funds for hazardous waste disposal program to comply with State and Federal regulations for the control of hazardous waste disposal. ($0.5M)
- (U) Provide for annual State of Tennessee Beneficial Use Tax. ($4.5M)
- (U) Provide for the Tennessee Business Tax Reclassification. ($0.1M)
- (U) Provide support funding for the T-3 Engine Test Cell modification IOC to include checkout and certification of the cell/facility. ($1.1M)

Program Element: #0605807F
PE Title: Test and Evaluation Support

Budget Activity: #6 - Defense-Wide Mission Support

- (U) Provide support funding for the 16 Foot Supersonic Wind Tunnel (16S) including advanced airframe model development. ($1.8M)
- (U) Provide funding for the High Temperature Lab Addition (HTLA) to expand the arc heater test capability to perform advanced technology investigations. ($1.8M)
- (U) Fund DECADE facility support for assessing x-ray radiation effects on space-based assets and missile systems. ($0.3M)
- (U) Fund the National Research Council Study to assess and make recommendations on needed Air Force ground environmental aerospace systems test capabilities for the next 20-30 years. ($0.1M)
- (U) Implement the Federal Acquisition Regulation (FAR) requirement to change the focus of the property operations from a supply oriented to a property administration focus. ($.2M)
- (U) Provide funds to begin work on day-to-day maintenance deferred in recent years; reduces potential program delays and repair costs due to test facility breakdowns. ($0.3M)

(U) FY 1993 Planned Program:
- (U) Continue test infrastructure overhead support activities as stated above including Tennessee Beneficial Use Tax, FAR requirements, DECADE facility maintenance, 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) Provide increase to offset inflation from FY 92 to FY 93. ($7.0M)
- (U) Fund civilian pay raise. ($0.5M)
- (U) Fund contract mandated pay raises for operating contractor work force. ($6.4M)
- (U) Increase ...e funding for the High Temperature Lab Addition to make up for past delays in funding. ($1.9M)
- (U) Provide expertise in long-term planning for hazardous waste disposal as well as future test facility requirements. ($1.0)
- (U) Procure an advanced central scientific computer and mass storage unit to meet computing requirements of programs such as SEEK EAGLE, NASP, SDI, and F-22. ($2.8M)
- (U) Provide overhead operating funds for the new Four Foot Transonic Wind Tunnel Independent Drive System. ($0.5M)

(U) Work Performed By: Primary contractors performing test support include Sverdrup Technology, Inc., Calspan Corporation, and SSI Services, Inc.

(U) Related Activities:
- (U) PE 0605878F, Maintenance and Repair; PE 0605876F, Minor Construction; and PE 0605856F, Environmental Compliance. (Property maintenance and environmental compliance)
- (U) PE 0605896F, Base Operations RDT&E. (Base operating support)
- (U) PE 0604755F, Improved Capability for DT&E. (Technical capability Improvement and Modernization)
- (U) PE 0604940D, Test Instrumentation Development. (T&E Investments for new tri-service test capabilities)
- (U) There is no unnecessary duplication of effort within the Air Force and the Department of Defense.

Program Element: #0605807F
PE Title: Test and Evaluation Support

Budget Activity: #6 - Defense-Wide Mission Support

(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) and Electronic Combat 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, the Preflight Integration of Munitions and Electronic Systems (PRIMES) facility, the 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, training, and proficiency flying for aircrews supporting the test mission. Funding pays for a government and contractor work force responsible for providing test support consistent with AFDTC's role as center of expertise in electronic combat and air-to-air and air-to-surface munitions integrated test and evaluation. Also included are operations and maintenance contracts necessary to support testing on this 724 square mile land and 86,500 square mile water range.

(U) FY 1991 Accomplishments:
- (U) Provided test infrastructure overhead support for range operations contract to support existing test programs and the partial operation of three new threat radar simulators for validation testing of electronic combat systems. (Selected maintenance and spare test equipment purchases deferred)
- (U) Continued 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 included AGM-130, MMW MAVERICK, Sensor Fused Weapon (SFW), AN/ALE-47, and Silent Attack Warning System (SAWS).
- (U) Desert Storm supplement. ($1.4M)

(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.
- (U) Provide $5.5M for manpower realignment from MFP 7 O&M dictated by the conversion of Eglin AFB from the Munition Systems Division (MSD) to Air Force Development Test Center (AFDTC).
- (U) Provide $1.0M to convert military positions to civilian manpower authorizations.
- (U) Increase scope of range contract to provide a full year operation of three threat radar simulators, first full year of GWEF operations to include infrared guided weapon performance evaluation capability, and mandated Department of Labor (DOL) contractor work increases of $1.7M.

Program Element: #0605807F
PE Title: Test and Evaluation Support

Budget Activity: #6 - Defense-Wide Mission Support

(U) FY 1993 Planned Program:
- (U) Continue test infrastructure overhead support for major electronic combat test programs, AMRAAM, JOINT STARS, ATARS, and SEEK EAGLE testing with increase of $2.5M for inflation.
- (U) Continue to increase the scope of the O&M range contract to provide for new threat systems, additional GWEF capabilities, and maintenance support required for newer, complex computer-controlled simulators. ($3.5M)
- (U) Allow for the development of test infrastructure to support EF-111 upgrade and ALR-56M FOT&E estimated at $0.4M.
- (U) Provide $3.6M to fund infrared range equipment replacements and refurbishments of old, obsolete, high-repair equipment supporting a highly critical national electronic combat test asset, deferred from previous year.
- (U) Fund ground equipment depot level reparables. ($3.0M)

(U) Work Performed By: In-house work force and VITRO Services, Ft. Walton Beach, FL.

(U) Related Activities:
- (U) PE 0605878F, Maintenance and Repair; PE 0605876F, Minor Construction; and PE 0605856F, Environmental Compliance. (Property maintenance and environmental compliance)
- (U) PE 0605896F, Base Operations RDT&E. (Base operating support)
- (U) PE 0604755F, Improved Capability for DT&E. (Technical capability Improvement and Modernization)
- (U) PE 0604735F, Range Improvement Program (RIP). (Range improvement for development of electronic combat threat systems, operations/support)
- (U) PE 0604940D, Test Instrumentation Development. (T&E Investments for new tri-service test capabilities)
- (U) PE 0605863F, RDT&E Aircraft Support. (Depot Maintenance Funds to support Air Force Systems Command test and evaluation aircraft)
- (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 the 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 vehicles, unmanned miniature vehicles, 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 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

Program Element: #0605807F
PE Title: Test and Evaluation Support

Budget Activity: #6 - Defense-Wide Mission Support

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 proficiency flying for aircrews supporting the test mission and the general overhead costs of the test organizations associated with providing test program support, as well as the total costs of the AFTPS. With the transfer of Depot Level Reparables to this account in FY92, the AFFTC will have a large funding increase due to the many varying mission aircraft requiring special ground test equipment. These DLR's include range instrumentation support, Special Purpose Recoverables Authorized to Maintenance (SPRAM), and IFAST instrumentation. Funding pays for a government and contractor work force responsible for providing test support consistent with AFFTC's role as center of expertise for aerodynamic/avionics systems test and evaluation. Also included are operations and maintenance contracts necessary to support testing on the range.

(U) FY 1991 Accomplishments:

- (U) Continued test infrastructure overhead to support 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 programs.
- (U) Continued operation of the BAF supporting increased capability for ground test of avionics systems. Funds supported utility costs, civilian pay, contractor support, and other costs that "keep-the-doors-open" in sustaining a generic test capability.
- (U) Continued test support to advanced avionics intensive weapon systems through test infrastructure management and systems integration. Level of avionics testing increased in both ground facilities (IFAST, BAF, TEMS) and during flight test. ($.4M)
- (U) Initiated aircraft support fleet modernization. Direct costs of instrumentation (engineering, modification dock, and materials) funded by this PE.
- (U) Desert Storm supplemental. ($5.2M)

(U) FY 1992 Planned Program:

- (U) Continue test infrastructure overhead to support testing of the B-1B, B-2, F-16, F-15, F-15E, C-17, ATF Dem/Val, AFTI/F-16, Gunship/Combat Talon II, DIRS, UARS, and classified programs.
- (U) Program content changes include the following:
  - Inflation. ($2.6M)
  - Military to civilian manpower conversion. ($2.0M)
  - BAF operation. ($6.1M transferred from PE 0604735F)
  - General Support Fleet upgrade for airframe and simulation systems. Areas include: Computer Aided Design ($0.7M) and Air Frame Systems Modernization ($0.9M).
  - AFTPS multi-engine curriculum (C-141/C-23A use) upgrade. ($1.2M)
- (U) Support NASP preparation. 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 efforts to ensure the NASP test requirements are integrated into the AFFTC's test infrastructure.

Program Element: #0605807F
PE Title: Test and Evaluation Support

Budget Activity: #6 - Defense-Wide Mission Support

- (U) Support testing of classified programs. (Classified programs require more extensive infrastructure to provide necessary security program)
- (U) Provide management and engineering efforts to support needed state-of-the-art upgrades to existing systems to preserve these capabilities for testing avionics intensive weapon systems in both ground test facilities and flight. (Upgrades are included in PE 0604755F and PE 0604735F) ($0.4M)

(U) FY 1993 Planned Program:

- (U) Continue test infrastructure overhead to support testing of the B-1B, B-2, F-16, F-15, F-15E, ATF, AFTI/F-16, Gunship/Combat Talon II, AFTI-16, DIRS, UARS, and classified programs. Includes inflation increases from FY 92 and FY 93. ($2.1M)
- (U) Support NASP preparation. Support consist of infrastructure, engineering, and technical site design efforts to posture the Center to be ready for this test effort. These are advanced planning efforts to ensure the NASP test requirements are integrated into the Center's test infrastructure.
- (U) Continue BAF operation and support as avionic intensive weapon systems in both ground facilities and during flight increases.
- (U) Support aircraft support fleet modernization. Includes instrumentation upgrades in support fleet to meet general test and AFTPS requirements. ($1.1M)
- (U) Continue program of replacement/modernization of aging range, shop, airframe, and simulation systems and equipment at FY92 levels. ($0.7M)
- (U) Funds ground equipment depot level reparables. ($10.2M)

(U) Work Performed By: Primary contractor performing test support is Computer Science Corporation (CSC), Lancaster, CA.

(U) Related Activities:

- (U) PE 0605878F, Maintenance and Repair; PE 0605876F, Minor Construction; and PE 0605856F, Environmental Compliance. (Property maintenance and environmental compliance)
- (U) PE 0605896F, Base Operations RDT&E. (Base operating support)
- (U) PE 0604755F, Improved Capability for DT&E. (Technical capability improvement and modernization)
- (U) PE 0604735F, Range Improvement Program (RIP). (Range improvement for development of electronic combat threat systems, operations/support)
- (U) PE 0604940D, Test Instrumentation Development. (T&E investments for new tri-service test capabilities)
- (U) PE 0605863F, RDT&E Aircraft Support. (Depot Maintenance Funds to support Air Force Systems Command test and evaluation aircraft)
- (U) PE 0708019F, Utah Test and Training Range Operations. (Operation and maintenance of Utah Test and Training Range O&M appropriation account)
- (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.

Program Element: #0605807F
PE Title: Test and Evaluation Support

Budget Activity: #6 - Defense-Wide Mission Support

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 the Air Force, other DOD agencies, and the National Aeronautics and Space Administration (NASA). The Wing operates Air Force Systems Command 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 Command, Control and Communications to aerodynamic and structural evaluations of highly modified RDT&E aircraft. Staging out of the U.S. 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 proficiency flying for aircrews supporting the test mission. Funding also supports a government work force responsible for maintaining 4950 TW's role as center of expertise in avionics sub-systems, CAD/CAM, and testing commercial aircraft.

(U) FY 1991 Accomplishments:
- (U) Continued test infrastructure overhead to provide ARIA flight test support to DOD and NASA programs including Trident, Polaris, Titan, Delta Star, Scout, DMSP, MILSTAR, Landsat, DMSS, and other space launches.
- (U) Continued fabrication/modification and flight test support to Wright Lab and other DOD and government organizations.
- (U) Completed Electronic Counter-Countermeasures Advanced Radar Testbed (ECCM/ARTB) aircraft.
- (U) Delayed IOC of one Sonobuoy Missile Instrumentation Location System (SMILS) into FY 92.
- (U) Provided overhead to support initial operation of Cruise Missile Mission Control Aircraft (CMMCA).
- (U) Provided contractor support for EC-18B drawing documentation for government specifications.
- (U) Purchased additional services of the Cumberland Group for Total Quality Management (TQM) training.
- (U) Upgraded Wing Information System (WIS) with the purchase of a new VAX and several software and license buys.
- (U) Funded a Radio Trunking System which enables the Test Wing to integrate into the base network.
- (U) Desert Storm supplement. ($2.7M)

(U) FY 1992 Planned Program:
- (U) Continue test infrastructure support for ARIA and systems flight test for DOD laboratory/acquisition programs including increase of $3.2M for deferred equipment replacements, inflation, and fuel cost.
- (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 FY 91) for CMMCA which will become operational with test completion on second production system. ($2.3M)

Program Element: #0605807F
PE Title: Test and Evaluation Support

Budget Activity: #6 - Defense-Wide Mission Support

- (U) Update the contractor C-18 Maintenance Technical Orders and EC-18B modification drawing documentation to government specifications (deferred from FY 90 and FY 91) for more efficient support to existing aircraft test equipment. ($1.2M)
- (U) One Sonobuoy Missile Instrumentation Location System (SMILS) will enter initial operational capability.
- (U) Continue to upgrade the WIS.

(U) FY 1993 Planned Program:
- (U) Continues test infrastructure overhead support for ARIA SMILS and flight test support with increase for fuel adjustment and inflation. ($2.0M)
- (U) Purchase remainder of spare test equipment for CMMCA. ($0.6)
- (U) Continue technical order and documentation update of Test Wing aircraft with projected completion in FY 94. ($1.5M)
- (U) Complete ECCM/ARTB and begin full support funding for the new test capability on a C-141 aircraft. ($1.4M)
- (U) Fund ground equipment depot level reparables. ($1.5M)

(U) Work Performed By: In-house work force.

(U) Related Activities:
- (U) PE 0604755F, Improved Capability for DT&E. (Technical capability improvement and modernization)
- (U) PE 0604940D, Test Instrumentation Development. (T&E Investments for new tri-service test capabilities)
- (U) PE 0605863F, RDT&E Aircraft Support. (Depot Maintenance Funds to support Air Force Systems Command test and evaluation aircraft)
- (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. Effective 1 October 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 1992 Accomplishments: N/A.

(U) FY 1992 Planned Program:
- (U) Funds for exchangeable aircraft parts transferred into this account in preparation for the DOD stock funded program initially planned to start in 2nd quarter.

(U) FY 1993 Planned Program:
- (U) Begin full year funding for repair of flying hour related spare parts for test aircraft.

(U) Work Performed By: This project will be accomplished by government labor.

Program Element: #0605807F
PE Title: Test and Evaluation Support

Budget Activity: #6 - Defense-Wide Mission Support

(U) Related Activities:
- (U) PE 0605863F, RDT&E Aircraft Support. (Depot Maintenance Funds to support Air Force Systems Command test and evaluation aircraft)
- (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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605808F
PE Title: Development Planning

Budget Activity: #6-
Defense Wide Mission Support

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Development Planning | 8,843 | 8,883 | 20,603 | Cont | TBD |
| Total | 8,843 | 8,883 | 20,603 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: Program content has increased in FY 1993 due to changes in the acquisition process. In the past, programs were initiated at Milestone 0 and funding support was provided for concept exploration and definition studies within individual acquisition programs. Current DoD policy mandates that a full range of alternatives must be considered before initiating a new acquisition program. This program element is dedicated to funding those early technical assessments (concept exploration and definition) that enable the USAF to make cost effective, operational decisions on whether to continue supporting existing systems or producing new systems. Funding supports mission area assessments, mission need analyses, and cost and operational effectiveness analyses (COEAs)--evaluates alternatives to determine system limitations/technical risks, potential weapon system capabilities, and weapon system ownership/life cycle costs. This program element investigates the operating commands' highest priority mission needs.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:

- (U) Defined DoD role in the Space Exploration Initiative.
- (U) Established viable concepts for future satellite control developments for greater interoperability/survivability.
- (U) Analyzed suitability of Contingency TACS Automated Planning System to meet NATO Air Command and Control System (ACCS) requirements.
- (U) Defined analysis and modeling capabilities to support F-16 human centered technical/system requirements.
- (U) Examined concepts for mobile command centers which can survive/endure for extended periods and manage strategic forces without external support.
- (U) Developed options/conducted trade-off studies to define cost-effective F-15/F-16 maintenance training technologies.
- (U) Evaluated capability of future fighter/attack force structure to counter the projected threat in a variety of scenarios.
- (U) Evaluated alternatives for providing a near-term capability for SAC bomber delivery of precision guided munitions.
- (U) Performed feasibility assessment of existing candidate systems for theater missile defense and demonstrated use of Tactical ACCS to simulate theater environment.
- (U) Analyzed options to improve mission effectiveness/supportability of multiple aircraft in composite wings.
- (U) Developed technical "blueprint" of the MAC C4 environment.
- (U) Analyzed options for increased intra-theater airlift capability to meet increased mobility sustainability needs.
- (U) Identified innovative Non-Cooperative Target Identification concepts and support formulation of optimized investment strategy utilizing these high payoff technologies.

Program Element: #0605808F
PE Title: Development Planning

Budget Activity: #6- Defense Wide Mission Support

- (U) Supported concept alternative studies of tactical space systems and rapid-response launch vehicle architectures.
- (U) Conducted studies of tactical weather systems to include observing and forecasting systems to support operations.

(U) FY 1992 Planned Program:
- (U) Complete technology assessment, acquisition strategy plan, and specifications for F-15/F-16 maintenance skills training.
- (U) Complete joint study of alternatives for emergency release of extraction parachutes when a malfunction prevents the airdrop cargo load from departing the aircraft.
- (U) Complete mission need analysis and other Milestone 0 documentation support for multi-role fighter.
- (U) Identify cost-effective T-38 enhancements and evaluate as an alternative for the Bomber Fighter Training System.
- (U) Evaluate concepts for jam resistant, low probability of intercept/detection data links for contingency aircraft.
- (U) Establish preliminary system requirements and options for an ICBM capability in the next century.
- (U) Evaluate key concepts and technologies for distributed, interoperable satellite control architectures.
- (U) Proceed with last 8 FY 1991 efforts in FY 1992.

(U) FY 1993 Planned Program:
- (U) Complete feasibility analysis of augmenting AWACS capability with IR surveillance to detect theater launched missiles.
- (U) Complete assessment of technology impacts and opportunities to support the emerging composite wing operations.
- (U) Complete evaluation of concepts for jam resistant, low probability of identification/detection data links.
- (U) Complete technical assessment and areas for standardization of distributed, interoperable satellite control architecture.
- (U) Initiate technical assessment of alternatives and COEA support for multi-role fighter.
- (U) Analyze theater threats/protective measures for aircraft.
- (U) Initiate assessment of low cost options for third world assistance for counterinsurgency and counternarcotics ops.
- (U) Initiate an assessment of alternative methods for lethal suppression of enemy air defenses--Desert Storm lessons.
- (U) Investigate alternatives of using existing/new DoD and national space systems to support theater commanders--Desert Storm lessons.
- (U) Evaluate alternatives and derive cost/benefit tradeoffs between current launch technology and innovative launch concepts for a responsive, supportable future launch capability.
- (U) Perform mission need analysis of transport/tanker cockpits to increase safety, improve training and mission performance, and reduce aircrew size due to cockpits designed from an aircrew standpoint and mission need.
- (U) Examine C4 systems integration options for future global force projection missions to support theater commanders.
- (U) Identify measures of effectiveness and evaluate alternatives for countering mobile targets.
- (U) Investigate alternatives to improve bomber conventional lethality--the most effective munitions types and concepts.
- (U) Initiate mission need analysis of alternatives for future aeromedical evacuation--evaluates aging C-9 fleet.
- (U) Initiate technical assessment of alternatives for replacing/upgrading existing Joint US-Canadian air defense systems.
- (U) Continue last 8 in FY 1991 and last 4 in FY 1992.
- (U) Increase is due to funding program through Milestone 0.

Program Element: #0605808F
PE Title: Development Planning

Budget Activity: #6-
Defense Wide Mission Support

(U) Work Performed By: Technical analysis to evaluate concepts is primarily performed by Aeronautical Systems Division, Wright-Patterson AFB OH; Electronic Systems Division, Hanscom AFB MA; Space Systems Division, Los Angeles AFB CA; and Human Systems Division, Brooks AFB TX. 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 integration of 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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605856F
Title: Environmental Compliance

Budget Activity: 6-Defense-Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 06EC Environmental Compliance | 0 | 0 | 12,373 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides essential environmental compliance (EC) services at three Air Force Materiel Command Major Range and Test Facility Bases (MRTFBs)--Eglin AFB, FL; Edwards AFB, CA; Arnold AFB, TN. The account provides funds for Operations and Services (O&S), Category I, II and III (recurring and non-recurring) requirements to comply with environmental protection/compliance laws i.e, hazardous waste management and disposal; replacement/removal underground storage tanks; air and noise pollution; asbestos abatement and removal; and other toxic substances. Also funds for pollution sampling, studies, testing and inspections/repair of processing equipment; permits and fees; monetary assessments, fines and penalties; National Environmental Policy Act (NEPA); Environmental Compliance Assessment and Management Program (ECAMP) and natural/cultural/historic land management. In FY 92 and prior, this program was funded in PE 0605894F.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) Project 06EC, Environmental Compliance (EC): Project funds EC projects and resources for Civil Engineering "must pay" services (recurring) and infrastructure maintenance and repairs (non-recurring) to comply with environmental protection and compliance laws and regulations; monetary assessments, fines and penalties; natural/cultural/historic/land management and related administration.

(U) FY 1991 Accomplishments:
- (U) Not Applicable.

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

(U) FY 1993 Planned Program:
- (U) Previously this effort was supported in PE 0605894F under BPAC 6606EC.

Program Element: #0605856F
Title: Environmental Compliance

Budget Activity: 6-Defense-Wide Mission Support

- (U) Provides funds for O&S and projects classified as category I and II requirements. EC requirements consist of: hazardous and solid waste removal ($1.6); repair underground storage tanks ($1.8M); connect oil/water separators ($1.0M); natural and cultural resource requirements ($1.7M); Resource Conservation and Recovery Act ($2.4M); facility projects ($1.3M); and maintain level of effort to provide civilian pay, supplies, permits ($2.6M) and appropriate inflation.

(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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605863F
PE Title: RDT&E Aircraft Support

Budget Activity: #6-Defense-wide Mission Support

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Completion | Total Program |
|---|---|---|---|---|---|
| 2111 Air Force Development Test Center (AFDTC) | 8,269 | 8,957 | 7,000 | Cont | TBD |
| 2112 Air Force Flight Test Center (AFFTC) | 27,643 | 17,207 | 24,600 | Cont | TBD |
| 2114 4950th Test Wing | 19,320 | 17,339 | 13,700 | Cont | TBD |
| Total | 55,232 | 43,503 | 45,300 | 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 184 RDT&E aircraft of 22 different types. These include a multitude of configurations, with many prototype, preproduction, and extensively modified/instrumented one-of-a-kind aircraft. Funds pay for depot level 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; depot provided area assistance; and assorted ground support equipment that requires reimbursement. Effective FY 92, funds previously planned for exchangeables (recoverable components, such as fuel pumps and electric motors) were zero base transferred to PE 0605807F for the new Stock Fund of Depot Level Reparables, under Defense Management Review Directive (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 primary 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(3); F-4E(2); RF-4C(2); F-15A(2); F-15B(3); F-15C(1); F-15D(1); F-15E(2); F-16A(3); F-16B(6); F-16C(4); F-111E(3); UH-1N(2); T-38A(3); and AT-38B(2). Total Aircraft Assigned: 40.

(U) FY 1991 Accomplishments:
- (U) PDM was accomplished on one F-4D.
- (U) Special inspections were done on Eglin's two UH-1Ns and four T-38s went through the Pacer Classic Program at San Antonio Air Logistics Center.
- (U) Special Purpose Vehicles (four compressed gas trailers, one R-11, one P-8, and two P-12s) were overhauled.
- (U) Area assistance was provided to repair F-111E, SN 67-115.
- (U) Eglin flew 5,536 hours which generated corresponding engine and exchangeable overhaul 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 one C-130A and one F-15A. On Condition Maintenance (OCM) will be accomplished on one UH-1N.
- (U) Analytical Condition Evaluation (ACE) will be accomplished on two UH-1Ns. Five F-16s will go into Ogden Air Logistics Center for update and modification.
- (U) Special Purpose Vehicles (two MB-34s, two P-8s, one P-12, and one compressed gas trailer) will be overhauled.
- (U) Ten F100-200 engines will be input for modification/update.
- (U) Eglin is projecting 6,393 flying hours which will generate corresponding engine overhaul requirements.

(U) FY 1993 Planned Program:
- (U) PDM will be accomplished on two RF-4Cs, one F-4D, one F-15B, and one F-111E.
- (U) The annual Analytical Condition Evaluation (ACE) will be done on the two UH-1Ns.
- (U) Special Purpose Vehicles (one R-9, two P-12s, and nine MB-4s) will be overhauled.
- (U) Eglin is projecting 5,354 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 all five AFLC ALCs. Contractually, work is performed by McDonnell Douglas Corp., Tulsa, OK; Boeing Military Airplane Company, Wichita, KS; Lockheed, Marietta, GA; PEMCO, Birmingham, AL; and General Dynamics, Ft. Worth, TX.

(U) Related Activities:
- (U) PE 0605807F, Test and Evaluation Support. (Test aircraft operation)
- (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: 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 quantities of test/test support aircraft assigned: A-7D/F/K(5); NAO-37B(4); B-1(2); B-2(3); B-52G(1); B-52H(1); DC-130A(1); C-130B(2); C-130H(4); F-4C(1); RF-4C(3); F-4E(3); F-15A(4); F-15B(5); F-15D(2); F-15E(3); F-16A(9); F-16B(16); F-16C(7); F-16D(2); H-1H(4); UH-1N(2); MH-60G(3); T-38A(22); U-26A(1). Total aircraft assigned: 110.

(U) FY 1991 Accomplishments:
- (U) PDM was accomplished on one NC-130B, one RF-4C, one F-15A, and one F-15D.
- (U) Analytical Condition Evaluation (ACE) was accomplished on

seven H-1s and the two CH-53As.
- (U) Three F-16s, one A-37 and, ten T-38s were input for modification/update.
- (U) HAVE PHOENIX cost $4.5M.
- (U) Special purpose vehicles (one MB-4, one R-9, one three P-12s, four P-2s, one wrecker, eight fork lifts, three tractors, two P-18s, retrofit of several R11s, one telephone truck, and one runway sweeper) were overhauled.
- (U) Edwards AFB and Hill AFB flew a total of 23,157 hours which generated corresponding engine and exchangeable requirements.

(U) FY 1992 Planned Program:
- (U) PDM will be accomplished on one C-130B and one F-15A.
- (U) Analytical Condition Evaluation (ACE) will be done on the six H-1s.
- (U) Six F-16s and five T-38s will be input for update/modification.
- (U) Nine F-100-200 engines will be modified/overhauled to the 220E configuration.
- (U) Special purpose vehicles (five 38 Cylinder Compressed Gas Trailers) will be overhauled.
- (U) Edwards AFB and Hill AFB are projecting 24,981 flying hours which will generate corresponding engine overhauls.

(U) FY 1993 Planned Program:
- (U) PDM will be accomplished on one B-1B, one NF-4E, one F-15A, and one F-15D.
- (U) Analytical Condition Evaluation will be done on the H-1s.
- (U) Six F-16s will be input for modifications.
- (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 AFB and Hill AFB are projecting 25,458 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 all five AFLC ALCs. Contractually, work is being performed by McDonnell Douglas Corp., Tulsa, OK; Boeing Military Airplane Company, Wichita, KS; Lockheed, Marietta, GA; PEMCO, Birmingham, AL; and Vought Corp., Dallas, TX.

(U) Related Activities:
- (U) PE 0605807F, Test and Evaluation Support. (Test aircraft operation)
- (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.

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 DOD and National Aeronautics and Space Administration. The 4950th Test Wing currently has the following types and quantities of test/test support aircraft assigned:

C-18B(1); EC-18B(4); EC-18D(2); C-135A(7); C-135E(8); NC-141A(4); T-39A(2); and T-39B(6). Total aircraft assigned: 34. Additionally, 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 FY 92/93/94 contracts and agreements, AFSC is responsible for costs associated with one NC-131H, one NT-33A, and the VISTA F-16. Costs for these three aircraft are included in the 4950th Test Wing project.

(U) FY 1991 Accomplishments:
- (U) PDM was accomplished on two C-18s, three C-135s, and one NC-141A.
- (U) C-18 Component Overhauls and Sustaining Engineering efforts cost $3.8M.
- (U) Special inspections were accomplished to ensure the structural integrity/flight worthiness of the NC-131H and the NT-33A after the engines on the NC-131H were upgraded.
- (U) The 4950th Test Wing flew 7,491 hours which generated corresponding engine overhaul requirements.

(U) FY 1992 Planned Program:
- (U) PDM will be accomplished on two C-18s, four C-135s, and one NC-141A.
- (U) Special inspections will be done on the NC-131H and the NT-33A.
- (U) C-18 Component Overhauls and Sustaining Engineering is projected to cost $5.5M.
- (U) The 4950th Test Wing is projecting 7,686 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) Special inspections will be accomplished on the NC-131H and NT-33A.
- (U) C-18 Component Overhauls and Sustaining Engineering are projected to cost $5.8M.
- (U) The 4950th Test Wing is projecting 7,310 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 E-Systems, Inc., Greenville, TX; Boeing Military Airplane Company, Seattle, WA; Lockheed, Marietta, GA; and the Vought Corp., Dallas, TX.

(U) Related Activities:
- (U) PE 0605807F, Test and Evaluation Support. (Test aircraft operation)
- (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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605876F
Title: Minor Construction (RPM) - RDT&E

Budget Activity: 6-Defense-Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 8943 Minor Construction | 0 | 0 | 842 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides essential Minor Construction (MC) at three Air Force Materiel Command Major Range and Test Facility Bases (MRTFBs)--Eglin AFB, FL; Edwards AFB, CA; Arnold AFB, TN. 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. In FY 92 and prior, this program was funded in PE 0605894F.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 8943, Minor Construction (MC): Project adapts facilities to current mission needs/standards through additions, alterations, replacements, relocations, new facilities, and related administration. The funded cost of each undertaking cannot exceed $15,000.

(U) FY 1991 Accomplishments:
- (U) Not Applicable.

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

(U) FY 1993 Planned Program:
- (U) This effort was supported previously in PE0605894F.
- (U) Continuing level of effort to accomplish minimum in-house MC. MC requirements include work required for addition to, alteration, expansion or extension to a facility; and procurement and installation of Real Property Installed Equipment.
- (U) Level of effort funding to provide minimum mission requirements.

Program Element: #0605876F
Title: Minor Construction (RPM) - RDT&E

Budget Activi . 5-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) PE0605807F, Test and Evaluation Support (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.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605878F
Title: Maintenance and Repair (RPM) - RDT&E

Budget Activity: 6-Defense-Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 8942 Mnt & Repair of Real Prop | 0 | 0 | 12,200 | Cont | TBD |

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides essential Real Property Maintenance operations at three Air Force Materiel Command Major Range and Test Facility Bases (MRTFBs)--Eglin AFB, FL; Edwards AFB, CA; Arnold AFB, TN. 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. In FY 92 and prior, this program was funded in PE 0605894F.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) Project 8942, Maintenance and Repair of Real Property: Project funds all Maintenance and Repair (M&R) under $15,000 of basic infrastructure and test facilities to slow deterioration; ensure preservation of Air Force facility investment; and related administration.

(U) FY 1991 Accomplishments:
- (U) Not Applicable.

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

(U) FY 1993 Planned Program:
- (U) Previously this effort was supported in PE 0605894F.

Program Element: #0605878F
Title: Maintenance and Repair (RPM) - RDT&E

Budget Activity: 6-Defense-Wide Mission Support

- (U) Continuing level of effort to accomplish minimum in-house, day-to-day Maintenance and Repair (M&R) for mission requirements to offset current degrading effects and deterioration of the physical plant. M&R requirements include: interior and exterior electrical; entomology; air conditioning, refrigeration and heating systems; pavements and grounds; structural includes protective coating, plumbing, and roofs; airfields and runways, and other fire, health, and safety requirements.

- (U) In house M&R projects will only be accomplished when there is a major infrastructure failure. Accomplishing emergency M&R projects (under $15,000) will result in more costly repairs because of collateral damage done to facilities by the emergency situation; and delay vital weapon system testing.

(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) PE0605807F, 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.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 8941 Operation of Utilities | 18,567 | 18,682 | 0 | Cont | TBD |
| 8942 Maintenance and Repair of Real Property | 33,642 | 34,579 | 0 | Cont | TBD |
| 8943 Minor Construction | 2,775 | 2,394 | 0 | Cont | TBD |
| 8944 Other Support | 22,928 | 25,892 | 0 | Cont | TBD |
| 06EC Environmental Compliance | 3,632 | 18,100 | 0 | Cont | TBD |
| Total | 81,544 | 99,647 | 0 | 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. All funding in this program element will migrate into PE 0605896F, Base Operations RDT&E, PE 0605876F, Minor Construction (RPM) RDT&E, PE 0605878F, Maintenance and Repair (RPM) RDT&E, and PE 0605856F, Environmental Compliance RDT&E in FY 93.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides essential RPM operations at three Air Force Materiel 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 physical 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.

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 1991 Accomplishments:
- (U) Purchased utilities and operated utility plants and distribution systems.

(U) FY 1992 Planned Program:
- (U) Continue purchase of utilities and operation of utility plants and distribution systems.

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

(U) Work Performed By: In-house work force; Southern California Edison (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 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 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 1991 Accomplishments:
- (U) Performed minimum mission critical M&R to offset degrading effects and deterioration of the physical plant.
- (U) Funding for environmental projects transferred to a separate line item.
- (U) Funds transferred to cover "must pay" requirements in other projects.

Program Element: #0605894F
Title: Real Property Maintenance Activity (RPMA)

Budget Activity: 6-Defense-Wide Mission Support

- (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) FY 1992 Planned Program:
- (U) Continuing level of effort to accomplish minimum M&R mission requirements to offset degrading effects and deterioration of the physical plant.
- (U) Funding for environmental requirements transferred to a separate line item.
- (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) FY 1993 Planned Program:
- (U) Not Applicable.

(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 $300 thousand.

(U) FY 1991 Accomplishments:
- (U) Continued level of effort to provide minimum mission requirements.

(U) FY 1992 Planned Program:
- (U) Continuing level of effort to provide minimum mission requirements.

Program Element: #0605894F
Title: Real Property Maintenance Activity (RPMA)

Budget Activity: 6-Defense-Wide Mission Support

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

(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 1991 Accomplishments:
- (U) Provided minimum health and safety services required to support bases' missions.

(U) FY 1992 Planned Program:
- (U) Continues minimum support services.
- (U) Increase in funding above inflation is a result of increased costs in custodial contract at Eglin ($1.0M) and Base Comprehensive Plan (BCP) requirements ($1.0M).

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

(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.

Program Element: #0605894F
Title: Real Property Maintenance Activity (RPMA)

Budget Activity: 6-Defense-Wide Mission Support

(U) Other Appropriation Funds: Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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 1991 Accomplishments:
- (U) Provided 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 requirements e.g., replacement of underground storage tanks and above ground fuel tanks ($2.0M), removal of hazardous and solid waste ($1.9M); repair of sewage treatment plants ($.4M); fuel dikes ($1.0M) connect oil/water separators ($1.0M); RCRA ($1.0M); natural resources requirements ($2.4M); facility projects ($2.3M); service contracts ($3.0M); ECAMP ($.8M); and maintain level of effort to provide for civilian pay, supplies, TDY, permits ($2.3M) and appropriate inflation.
- (U) EC problems have resulted in Notice of Violation (NOVs) at all three bases and the placement of Edwards AFB on the National Priorities List.

Program Element: #0605894F
Title: Real Property Maintenance Activity (RPMA)

Budget Activity: 6-Defense-Wide Mission Support

- (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; asbestos abatement to include abatement studies, sampling, testing, and removal; underground tank monitoring and leak testing repair and removal; Polychlorinated Biphenyls (PCBs) and other toxics; permits/fees; and environmental assessments have all experienced regulatory changes over the last two years.

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

(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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605896F
PE Title: Base Operations RDT&E

Budget Activity: #6 - Defense-Wide Mission Support

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 6606BS Base Operating Support | 61,722 | 73,454 | 81,618 | Cont | TBD |
| 668941 Operation of Utilities | 0 | 0 | 19,796 | Cont | TBD |
| 668944 Health and Safety Services | 0 | 0 | 26,696 | Cont | TBD |
| Total | 61,722 | 73,454 | 128,110 | Cont | TBD |

NOTE: This is one of several Air Force RDT&E test infrastructure accounts which provide direct support to the DOD test mission. The aggregate FY 93 budget for these accounts reflects a significant negative real growth since 1968. As a result, significant technology advancements have occurred during this time period without the corresponding 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 the Air Force portion of the DOD Major Range and Test Facility Base (MRTFB) which includes Arnold Engineering Development Center (AEDC), Air Force Flight Test Center (AFFTC), and Air Force Development Test Center (AFDTC). These three locations have over 90 tenant organizations and an aggregate population in excess of 55,000 people. Civilian pay represents approximately 47 percent of the total program, with the remainder of the program financing administrative support, security and guard services, dormitories, billeting, food services, training, utility operations, civil engineering services, 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 affects 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:

1. (U) Project 6606BS, Base Operating Support: Funds bare essential base operating support, civilian pay and quality of life services for the respective bases, thus allowing the complex and sophisticated test mission of their organization to be accomplished.

(U) FY 1991 Accomplishments:
- (U) Provided minimal base operating support for three test centers.

Program Element: #0605896F
PE Title: Base Operations RDT&E

Budget Activity: #6 - Defense-Wide Mission Support

- (U) Funded 916 civilian manyears with a payroll in excess of $35M.

(U) FY 1992 Planned Program:
- (U) Restores base operating support to three AFSC bases only to the FY 90 level which will allow minimal testing required ($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 (the former Munitions Systems Division was O&M funded) to an RDT&E test center host ($4M civilian pay for 114 positions and $1.2M support costs) and military-to-civilian conversions of 22 manpower positions (civilian pay $0.4M) directed by 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 90 level which is required if the bases are to perform testing required ($1.8M civilian pay and $1.8M inflation).
- (U) Includes funding for military-to-civilian conversion of an additional 40 manpower positions ($1.1M civilian pay) directed by DMRD 917 and increased operational cost for the institution of the Defense Business Operating Fund ($1.4M) directed by DMRD 971.
- (U) Fund 1,037 civilian workyears with a payroll in excess of $37M.

(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 Support, provides test mission operating funds to four Air Force RDT&E funded MRTFBs.
- (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.

Program Element: #0605896F
PE Title: Base Operations RDT&E

Budget Activity: #6 - Defense-Wide Mission Support

2. (U) Project 668941, Operation of Utilities: Funds purchase of utilities (electricity, natural gas, water and sewage treatment), base operation of water and sewage tratment plants and distribution systems (which are "must-pay" bills for Edwards and Eglin AFBs) and related administration. Amounts of utilities consumed and wastes processed for discharge exceed those of a normally operating base due to the testing mission.

(U) FY 1991 Accomplishments:
- (U) Project was funded under PE 0605894F during this year.

(U) FY 1992 Planned Program:
- (U) Project is funded under PE 0605894F during this year.

(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 Edison (SCE), CA; Pacific Gas and Electric Company, CA; Florida Power & Light, FL; and Gulf Power, FL.

(U) Related Activities:
- (U) PE 0605807F, Test and Evaluation Support, provides mission funds for utilities at Arnold AFB since test mission support consumes almost all utility efforts.
- (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.

3. (U) Project 668944, Health and Safety Services: Provides resources for civil engineering "must-pay" services such as custodial, fire protection, refuse collection, entymology, rentals/leases, Architectural and Engineering (A&E) Design, grounds maintenance and related administration.

(U) FY 1991 Accomplishments:
- (U) Project was funded under PE 0605894F during this year.

(U) FY 1992 Planned Program:
- (U) Project is funded under PE 0605894F during this year.

(U) FY 1993 Planned Program:
- (U) Continues minimum support services.

(U) Work Performed By: In-house work force; Cal Disposal, CA;

Program Element: #0605896F
PE Title: Base Operations RDT&E

Budget Activity: #6 - Defense-Wide Mission Support

Management Tech Services, CA; Computer Sciences Corporation, CA; Madison Services, MI; Environmental Waste, FL; and General Physics Corp., MD.

(U) Related Activities:
- (U) PE 0605894, Real Property Maintenance Activity.
- (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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0701112F
PE Title: Inventory Control Point Operations

Budget Activity: #6 - Defense-Wide Mission Support

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

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3090 Embedded Computer Resources Support Improvement Program (ESIP) | 4,837* | 0** | 0** | 0** | ** |
| XXX1 Class IV Multiapplication Modifications | 0 | 2,900 | 1,200 | 0 | 4,163 |
| Total | 4,837 | 2,900 | 1,200 | 0 | ** |

* 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 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): 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 to PE 0708012F, Logistics Support Activities, starting in FY92.

(U) FY 1991 Accomplishments:
- (U) Developed fault tolerant and distributed software techniques.

Program Element: #0701112F
PE Title: Inventory Control Point Operations

Budget Activity: #6 - Defense-Wide Mission Support

- (U) Demonstrated test suite execution.
- (U) Integrated communication/navigation/identification database into integrated electromagnetic system simulator.
- (U) Continued evaluating results from Modular Embedded Computer Software (MECS) study.
- (U) Completed phase I for operational flight program automated validation (AUTOVAL) effort and transition prototype to Hill AFB.
- (U) Awarded AUTOVAL phase II for automated test case generation.
- (U) Completed phase I for Multiple Avionics Processor Monitor (MAPM) tool.
- (U) Started development in high payoff areas from MECS study.
- (U) Evaluated software documentation tracing program.
- (U) Initiated data reduction/analysis visualization effort.
- (U) Explored 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; SBS, Houston TX; Draper Lab, 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.

(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 will require costly interim contractor logistics support at

Program Element: #0701112F
PE Title: Inventory Control Point Operations

Budget Activity: #6 - Defense-Wide Mission Support

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 1991 Accomplishments: Not Applicable.

(U) FY 1992 Planned Program:
- (U) Begin 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: 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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0702207F
PE Title: Depot Maintenance

Budget Activity: #6-Defense-Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

| Project Number and Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3326, Precision Measurement and Calibration Equipment Development (PMCED) | | | | | |
| | 2715* | 2936 | 2900 | Cont | TBD |
| TOTAL | 2715 | 2936 | 2900 | Cont | TBD |

* Funding in FY 1991 is in project 3909.

B. (U) BRIEF DESCRIPTION OF ELEMENT: Program develops, tests, and evaluates measurement standards and associated equipment for 180 base precision measurement equipment laboratories (PMEL) worldwide. The technology of modern weapons systems requires research and development of calibration to support the Air Force mission.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN FY 1993:

(U) Project 3326, PMCED. Designed to develop, test and evaluate standards and associated equipment used in the measurement and calibration of advanced weapons systems and support equipment to include such high technology as lasers, microwave, millimeter wave, electro-optical, and automatic test equipment.

(U) FY 1991 Accomplishments:
- (U) Completed thermal noise calibration capability from 12.4 gigahertz (GHz) to 18 GHz.
- (U) Established a calibration capability for MILSTAR antennas.
- (U) Established capability to measure group index and group delay in optical fibers at 1330 nanometers (nm) and 850 nm.
- (U) Extended noise calibration capability down to 10 megahertz.

(U) FY 1992 Planned Program:
- (U) Continue development of improved measurement capability for infrared and ultraviolet to support missile detection requirements.
- (U) Continue development of artifact testing of Coordinate Testing Machines.
- (U) Proceed with laboratory/field studies to improve basic standards for requirements for Air Force 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:
- (U) Continue design of laser, infrared, microwave, and millimeter wave standards and calibration capability for developing weapons systems.
- (U) Improve microwave material reflectivity measurements and field strength measurements to support low observable technologies.

Program Element: #0702207F
PE Title: Depot Maintenance

Budget Activity: #6-Defense-Wide Mission Support

- (U) Continue to improve base reference standards to increase measurement reliability and reduce costs of operational support as identified by the Joint Service Metrology Plan and the NIST.

(U) Work Performed By: The majority of the work is accomplished in-house by the Air Force Primary Standards Laboratory, Newark AFB, OH and the NIST at Gathersburg, MD and Boulder, CO. The contractors are Battelle, Columbus, OH, and Science Applications International Corporation, CA. All work is directed by Joint Technical Coordinating Group for Metrology and Calibration.

(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): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| MANTECH | 70,796 | 23,824* | 73,370 | Cont | TBD |
| Congressional Direction | 40,000 | | | | |

*36,000 proposed for rescission

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 1991 Accomplishments
   - (U) Initiate structural materials initiative for airframe manufacture.
   - (U) Initiate activities to establish paint removal techniques for large aircraft for ALCs.
   - (U) Complete efforts in latest metal cutting, cutting tools, machining data and systems technology to meet manufacturing subcontractors needs.
   - (U) Initiate effort for integrated product development of advanced 2D nozzles.
   - (U) Complete activities focused on information integration applied to airframe assembly.
   - (U) Continue work on information management and integration technologies to reduce lead time and non-touch labor costs.
   - (U) Complete efforts on manufacturing techniques for focal plane arrays and solar cells.
   - (U) Complete efforts on epitaxial growth of semiconductor and optical materials.
   - (U) Complete efforts on materials and fabrication techniques for critical engine materials.

Program Element: # 0708011F
PE Title: Industrial Preparedness
Project Number: 2865
Budget Activity: Defense Wide Mission Support

- (U) Complete efforts on assembly techniques for tactical missiles.
- (U) Complete science base activities in rugate filters.
- (U) Issued grant to National Center for Manufacturing Sciences IAW Congressional direction.
- (U) Initiated effort in metal matrix composites IAW Congressional direction.
- (U) Initiated effort in ductile iron modelling IAW Congressional direction.

2. (U) FY 1992 PLANNED PROGRAM:
   - (U) Terminate and/or implement six month stop work on all programs except those where the cost to terminate would exceed the cost to complete the effort.
   - (U) Complete shot peening, flexible repair center, static and accessory repair ALC insertion programs, thermoplastic airframe manufacturing, and the propulsion initiative.
   - (U) Descope efforts co-funded by other agencies to remove the Air Force ManTech funded share.
   - (U) Pre-initiate programs for early FY 1993 award (or restart).

3. (U) FY 1993 Planned Program:
   - (U) Start the following programs pre-initiated in FY 1992:
     - (U) Work on MMC gas generator case.
     - (U) Effort on metal forming simulation.
     - (U) Efforts to address environmental issues for ALCs.
     - (U) Initiate effort to provide short term analyses, assessments, feasibility validation and technical evaluations.
     - (U) Efforts on producibility for electronic subsystems.
     - (U) Composite engine repair processesses for ALCs.
     - (U) Efforts on advanced radar modules.
   - (U) Initiate effort on ordered polymer films.
   - (U) Initiate effort on low observable structures.
   - (U) Initiate effort on low temperature cofired ceramics.
   - (U) Continue effort on composite advanced tooling.
   - (U) Restart efforts on flexible microelectronics systems.
   - (U) Restart effort on radiation-hardened wafers.
   - (U) Reinitiate program for production of high temperature materials.
   - (U) Restart program to scale up advanced propellant binder materials.

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

Program Element: # 0708011F
PE Title: Industrial Preparedness
Project Number: 2865
Budget Activity: Defense Wide Mission Support

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; GA Technologies, Inc., San Diego, CA; Northrop Corporation, Hawthorne, CA; Westinghouse Corp., Pittsburg, PA; and the National Center for Manufacturing Sciences, Ann Arbor, MI.

E. (U) COMPARISON WITH FY 1992 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.

FY92 FINANCIAL PLAN
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 | FY1991 Actual | FY1992 Est | FY1993 Est | Additional to Complete | Total Est Cost |
|---|---|---|---|---|---|
| AIRCRAFT PROCUREMENT, AIR FORCE | | | | | |
| A0005 Design and Manufacture Of Advanced Thermoplastic Structures<br>ATF, F-16, F-15<br>Future Systems - 1 | 1200 | 696 | 0 | 0 | 10996 |
| A0268 Advanced Tooling for Composite Structures<br>Future Systems - 1 | 2300 | 600 | 2110 | 1700 | 8010 |
| A0378 Low Cost Composites Manufacturing<br>ATF, F-16, F-15<br>Future Systems - 1 | 2995 | 0 | 8800 | 23000 | 34795 |
| Aoxxx Rapid Manufacturing of Thermoplastic Radomes<br>Future Systems - 1 | 0 | 0 | 1000 | 1000 | 2000 |
| A0424 Ordered Polymer Films<br>Generic Applicability - 1 | 0 | 0 | 100 | 3400 | 3500 |
| A0408 Composite Manufacturing Cost Model<br>All Future Systems - 1 | 0 | 0 | 100 | 910 | 1010 |
| A0xxx Low Observables Structures/ Configurations Manufacturing and Production<br>ATF, Future Systems - 2 | 0 | 0 | 58 | 20525 | 20583 |
| A0008 Advanced Propulsion Materials (P&W)<br>Future Systems - 3 | 3100 | 808 | 0 | 0 | 62237 |
| A0273 Premium Quality Ti Alloy Disks<br>Advanced Engines - 3 | 510 | 200 | 594 | 1047 | 4250 |

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) Thrust Number | FY1991 Actual | FY1992 Est | FY1993 Est | Additional to Complete | Total Est Cost |
|---|---|---|---|---|---|
| AIRCRAFT PROCUREMENT, AIR FORCE | | | | | |
| A0418 Advanced Metal Matrix Foil Manufacturing Engines, Future Aircraft - 3 | 192 | 0 | 0 | 1608 | 2700 |
| A0410 High Speed Rough Machining of Airfoils ATF, Advanced Engines - 3 | 0 | 0 | 400 | 800 | 1200 |
| A0XXX Metal Matrix Composite Engine Components ATF, Advanced Engines - 3 | 2265 | 0 | 0 | 17507 | 19772 |
| A0XXX Cost Effective Manufacturing /Repair Methods For Propulsion Components ATF, Advanced Engines - 3 | 0 | 0 | 2500 | 6500 | 9000 |
| A0372 Radar Transmit/Receive Modules ATF Radar, Future Systems, Satellites - 4 | 4690 | 1300 | 5785 | 1000 | 18465 |
| A4047 Manufacture of Thermo-plastic Spares F-16, F-15, ATF, Future Systems - 5 | 60 | 650 | 890 | 3000 | 4600 |
| A0301 Enterprise Integration Program All Systems - 6 | 1700 | 0 | 0 | 21023 | 22723 |
| A0412 Active Matrix Liquid Crystal Displays (AMLCD) ATF, Aircraft Mods Future Systems - 9 | 0 | 0 | 1000 | 2200 | 3200 |
| Total Aircraft Procurement, Air Force, Related | | | | | |
| Overall Total | | 4254 | 23337 | | |

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) Thrust Number | FY1991 Actual | FY1992 Est | FY1993 Est | Additional to Complete | Total Est Cost |
|---|---|---|---|---|---|
| MISSILE PROCUREMENT, AIR FORCE | | | | | |
| A0300 Automated Fabrication of Small Engine Composite Compressor Rotors<br>Missile Engines - 7 | 563 | 500 | 0 | 0 | 3008 |
| A0406 Carbon-Carbon Components for Expendable Engines<br>Missile Engines - 7 | 100 | 600 | 1320 | 2247 | 3067 |
| A0405 Producible Missile Wings<br>Advanced Missiles - 7 | 200 | 350 | 1375 | 0 | 1925 |
| A0303 Advanced Binder Material<br>Future Tactical<br>Strategic Missiles - 7 | 1200 | 0 | 650 | 0 | 3200 |
| A0409 Titanium Aluminide Expendable Engine Structures<br>Missile Engines - 7 | 328 | 0 | 175 | 694 | 1197 |
| A0xxx Advanced Insulation<br>Future Tactical<br>Strategic Missiles - 7 | 0 | 0 | 100 | 2800 | 2900 |
| A0xxx Hybrid Composite Pressure Vessel<br>Future Tactical<br>Strategic Missiles - 7 | 0 | 0 | 500 | 1000 | 1500 |
| A0221 Silicon on Insulator Wafers<br>DSCS, MILSTAR,<br>Advanced Satellites - 8 | 1800 | 1000 | 2120 | 1035 | 7185 |
| A0275 Rugged Thin GaAs Solar Cells<br>Satellites - | 638 | 0 | 0 | 0 | 1938 |
| A0xxx Robust Electric Solar Cell Operational Verification (RESOLVE)<br>Satellites - 8 | 0 | 0 | 700 | 500 | 1200 |
| A0xxx Manufacturing of Thin Films<br>All Systems - 8 | 0 | 0 | 2500 | 6500 | 9000 |

Program Element: 0708011F
DoD Mission Area: 480 - Production Base Support
Budget Activity: 6 Defense Wide Mission Support



| Procurement Appropriation Support<br>Project (Title)<br>ID (End Items Supported)<br>Thrust Number | FY1991 Actual | FY1992 Est | FY1993 Est | Additional to Complete | Total Est Cost |
|---|---|---|---|---|---|
| MISSILE PROCUREMENT, AIR FORCE | | | | | |
| A0411 Advanced Ramjet Structures<br>Manufacturing<br>Advanced Missile Engines - 9 | 50 | 400 | 1320 | 1600 | 3370 |
| A0xxx Metal Matrix Composite<br>Gas Generator Case<br>Missile Engines - 9 | 0 | 0 | 1000 | 2200 | 3200 |
| Aoxxx Reactive Fragment<br>Warhead<br>Advanced Munitions - 9 | 0 | 0 | 1000 | 1200 | 2200 |
| Aoxxx Advanced Warhead<br>Manufacturing<br>AMRAM<br>Advanced Munitions - 9 | 0 | 0 | 1000 | 1000 | 2000 |
| A0xxx Low Voltage DMOS Power<br>Rectifier<br>Advanced Missiles - 9 | 0 | 0 | 300 | 600 | 900 |
| Total Missile Procurement, Air Force, Related | | | | | |
| Overall Total | | 2850 | 14060 | | |

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) Thrust Number | FY1991 Actual | FY1992 Est | FY1993 Est | Additional to Complete | Total Est Cost |
|---|---|---|---|---|---|
| O&M, AIR FORCE | | | | | |
| A0226 Flexible Repair Center Engine Case Repair - 5 | 2100 | 1157 | 0 | 0 | 13995 |
| A0187 Static & Accessory Repair Engine Repair - 5 | 1970 | 498 | 0 | 0 | 7861 |
| A0255 Robotics Applications (Shot Peening) Engine Repair - 5 | 600 | 692 | 0 | 0 | 2562 |
| A0366 Flexible Automated Welding Blade Repair Engine Repair - 5 | 0 | 0 | 1800 | 1643 | 3443 |
| A0381 Composite Engine Repair Center Engine Repair - 5 | 0 | 0 | 700 | 1475 | 2175 |
| A0224 Large Aircraft Robotic Paint Stripping Aircraft Repair - 5 | 700 | 700 | 1980 | 2925 | 6305 |
| A0276 Spare Parts Reprocurement and Production Support Spares Acquisition - 5 | 234 | 0 | 0 | 6100 | 8768 |
| A0367 Repair Technology for Printed Wiring Assemblies Electronics Repair - 5 | 500 | 350 | 440 | 550 | 1840 |
| A0xxx Chemical Tank Rejuvenation Engine Repair - 5 | 0 | 0 | 700 | 1100 | 1800 |
| A0xxx Metal Forming Simulation Airframe Repair - 5 | 0 | 0 | 600 | 1400 | 2000 |
| A0xxx Plating Bath Rejuvenation Engine Repair - 5 | 0 | 0 | 400 | 600 | 1000 |
| A0xxx IR Imaging of Phased Array Radiation Patterns Array Repair - 5 | 0 | 0 | 500 | 700 | 1200 |

| Procurement Appropriation Support<br>Project (Title)<br>ID (End Items Supported)<br>Thrust Number | FY1991<br>Actual | FY1992<br>Est | FY1993<br>Est | Additional<br>to<br>Complete | Total<br>Est<br>Cost |
|---|---|---|---|---|---|
| O&M, AIR FORCE | | | | | |
| Total O&M, Air Force, Related | | 3397 | 7120 | | |

Program Element: 0708011F
DoD Mission Area: 480 - Production Base Support
Budget Activity: 6 Defense Wide Mission Support



| Procurement Appropriation Supported<br>Project (Title)<br>ID (End Items Supported)<br>Thrust Number | FY1991 Actual | FY1992 Est | FY1993 Est | Additional to Complete | Total Est Cost |
|---|---|---|---|---|---|
| GENERIC PROCUREMENT | | | | | |
| A0295 Microelectronics Mfg<br>Science & Technology<br>All Systems - 4 | 5700 | 0 | 5170 | 6509 | 34470 |
| A0320 High Voltage Power Supplies<br>All Systems - 4 | 1300 | 900 | 1300 | 800 | 4667 |
| A0401 Advanced CMOS Gate<br>Dielectric Thin Films<br>All Systems - 4 | 400 | 41 | 0 | 0 | 496 |
| A0404 X-Ray Laminography<br>All Systems - 4 | 244 | 0 | 8 | 0 | 520 |
| A0402 Low Cost Fabrication<br>of GaAs MMICs<br>All Systems - 4 | 179 | 0 | 0 | 0 | 421 |
| A0xxx Whole-Wafer Inspection<br>of GaAs<br>All Systems -4 | 0 | 0 | 400 | 400 | 800 |
| A0xxx Laser Assisted Particle<br>Removal<br>All Systems - 4 | 0 | 0 | 73 | 56 | 129 |
| A0xxx Low Temperature Cofired<br>Ceramics<br>All Sysems - 4 | 0 | 0 | 17 | 2983 | 3000 |
| A0330 Manufacturing Technology<br>Special Studies<br>All Systems -6 | 10016 | 2970 | 775 | 0 | 23858 |
| A0370 Product Data Application<br>Protocols For Composites<br>All Systems - 6 | 365 | 200 | 1275 | 4150 | 5990 |

Program Element: 0708011F
DoD Mission Area: 480 - Production Base Support
Budget Activity: 6 Defense Wide Mission Support



| Procurement Appropriation Supported<br>Project (Title)<br>ID (End Items Supported)<br>Thrust Number | FY1991<br>Actual | FY1992<br>Est | FY1993<br>Est | Additional<br>to<br>Complete | Total<br>Est<br>Cost |
|---|---|---|---|---|---|
| GENERIC PROCUREMENT | | | | | |
| A0369 Integration Tool Kit & Methods<br>All Systems - 6 | 500 | 557 | 0 | 1883 | 2740 |
| A0400 Product Data Application Protocols for Electronics<br>All Systems - 6 | 100 | 500 | 1650 | 2194 | 4444 |
| A0420 Integrated Process Applications Manager<br>All Systems - 6 | 0 | 0 | 50 | 3250 | 3300 |
| A0415 Regional Rapid Prototyping Center<br>All Systems - 6 | 0 | 0 | 500 | 800 | 1300 |
| A0414 Manufacturing Technology Special Advanced Studies<br>All Systems - 6 | 0 | 0 | 5135 | 20000 | 25135 |
| A0xxx Integrated Product Processing Initiative<br>All Systems - 6 | 0 | 0 | 100 | 1100 | 1200 |
| A0398 Electronics Manufacturing Process Improvement<br>All Systems - 9 | 0 | 0 | 2000 | 2000 | 4000 |
| A0403 Fiber Optic Gyros All Self-Navigating Systems - 9 | 389 | 153 | 0 | 0 | 542 |
| Total Generic Procurement, Air Force, Related | | | | | |
| Overall Total | | 5321 | 18453 | | |

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 | FY1991 Actual | FY1992 Est | FY1993 Est | Additional to Complete | Total Est Cost |
|---|---|---|---|---|---|
| R&D, AIR FORCE | | | | | |
| A0306 Advanced Composite Processing<br>Generic Applicability - 10 | 415 | 233 | 0 | 0 | 1740 |
| A0304 Knowledge-Based Integrated Design System<br>Generic Applicability - 10 | 1634 | 600 | 660 | 864 | 4758 |
| A0328 Reliability without Hermeticity for MCMS<br>Generic Applicability - 10 | 800 | 0 | 1320 | 2143 | 4263 |
| A0305 Manufacturing Science for Carbon-Carbon Composites<br>Generic Applicability - 10 | 1700 | 600 | 0 | 2195 | 4871 |
| A0372 Integrated Product Development for Advanced Nozzles<br>Generic Applicability - 10 | 110 | 100 | 0 | 1290 | 1560 |
| A0422 Advanced Sensors for Control of Epitaxial Growth<br>Generic Applicability - 10 | 350 | 0 | 0 | 750 | 1500 |
| A0328 Reliability Without Hermeticity for ICs<br>Generic Applicability - 10 | 235 | 356 | 0 | 0 | 591 |
| A0386 HBC Initiative: Form - Feature Approach to Cylindrical Part Recognition<br>Generic Applicability - 10 | 131 | 0 | 150 | 0 | 351 |
| A0392 HBC Initiative: CIM Protocol and Logistics Cell<br>Generic Applicability - 10 | 104 | 0 | 110 | 101 | 416 |
| A0423 Alpha-2 Titanium Aluminide Composite Fabrication<br>Generic Applicability - 10 | 10 | 550 | 0 | 2150 | 4710 |
| A0xxx Feature Based Template for Producibility Analysis<br>Generic Applicability - 10 | 0 | 0 | 960 | 1238 | 2198 |

Program Element: 0708011F
DoD Mission Area: 480 - Production Base Support
Budget Activity: 6 Defense Wide Mission Support

| Procurement Appropriation Supported<br>Project (Title)<br>ID (End Items Supported)<br>Thrust Number | FY1991 Actual | FY1992 Est | FY1993 Est | Additional to Complete | Total Est Cost |
|---|---|---|---|---|---|
| R&D, AIR FORCE | | | | | |
| A0xxx Sensor Based Manufacturing of Thin Film Epitaxial Growth<br>Generic Applicability - 10 | 0 | 0 | 900 | 2100 | 3000 |
| Total R&D, Air Force, Related | | | | | |
| Overall Total | | 2439 | 4100 | | |
| Program Support | | 5563 | 6300 | N/A | N/A |
| Total Program | | 23824 | 73370 | | |

FY 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 3090 Embedded Computer Resources Support Improvement Program (ESIP) | 4,837* | 4,951 | 4,888 | Cont | TBD |
| 3317 Air Force Digital Specifications and Standards | 0 | 1,610 | 1,283 | 5,203 | 8,096 |
| TOTAL | 4,837* | 6,561 | 6,171 | Cont | TBD |

* Funding in 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 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 1991 Accomplishments:
- (U) See PE 0701112F.

(U) FY 1992 Planned Program:
- (U) Define automated test generation from requirements.
- (U) Pursue application of automated validation of software tests 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/stimulators for advanced support environment.

(U) FY 1993 Planned Program:
- (U) Demonstrate applicability of hypermedia technology to the automation and cross-referencing of software documentation.

Program Element: #0708012F Budget Activity: #6-Defense-Wide Mission Support
PE Title: Logistic Support Activities

- (U) Integrate Ada support tools into advanced support environment (ASE).
- (U) Demonstrate automatic test generation techniques in 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 Fund ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

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 funds the efforts necessary for the development of standards as designated by DOD.

(U) FY 1991 Accomplishments:
- (U) Established initial operating capability for an Air Force digital standards office.
- (U) Developed operating concept and initiated program management planning.
- (U) Completed requirements analysis of database for managing publication and interactive distribution of digital standards.
- (U) Prepared MIL-M-28001A Revision 1 for final approval and publication.
- (U) Developed database for publication and management of standards.

Program Element: #0708012F
PE Title: Logistic Support Activities

Budget Activity: #6-Defense-Wide Mission Support

(U) FY 1992 Planned Program:
- (U) Develop and publish MIL-M-28001B, MIL-M-28000A, MIL-R-28002A, MIL-D-28003A, and MIL-STD-1840B.
- (U) Review development work on content data models and review improved technical data system authoring and publishing systems.
- (U) Develop and publish standards for digital data acceptance and quality assurance, contractor integrated technical information services, and digital data security.
- (U) Activate lead standardization and preparation activities.

(U) FY 1993 Planned Program:
- (U) Develop and publish MIL-HDBK-59B and MIL-M-28001A handbook.
- (U) Develop and publish standards for hypertext; document style, semantics and specification language; and product description exchange specification.
- (U) Review and develop data management and functional standards.
- (U) Develop document type definitions and format output specification instance library and database.

(U) 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 ($ in Thousands): Not Applicable.

(U) International Cooperative Agreements: Not Applicable.

FY 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0708026F
PE Title: Productivity, Reliability, Availabiltiy, Maintainability (PRAM)
Program Number: N/A
Budget Activity: #6-Defense Wide Mission Support

A.(U) RESOURCES ($ in Thousands)

| Project Title Popular Name | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| Productivity, Reliability, Availability, Maintainability | | | | | |
| | 19,995 | 23,798 | 23,689 | 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 process. PRAM has 128 active projects with returns-on-investment averaging 11:1.

C.(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1991 Accomplishments:
   - (U) Prototype F-16 Thermoplastic Enclosures using lightweight composite materials for use on the F-16 to decrease weight. Like all other aircraft, the metal avionics enclosures are heavy, difficult to fabricate and repair, and are subject to corrosion. This successful project is also being considered for use in the ATF. Return-on-Investment is estimated at 26:1.
   - (U) Delivered and installed a prototype multi-point fixture test cell at Oklahoma City ALC (OC-ALC) for testing of fabric, steel cable, and rigid member lifting devices. This apparatus ensures cables that lift aircraft and engine parts can hold the load. This tester now gives OC-ALC the capability to meet regulations where previously contractor support was required. The testing can now be performed by AF personnel on site at a greatly reduced cost.
   - (U) Purchased an off-the-shelf lightweight test set (load bank) to replace cumbersome, trailer-mounted units. Suitcase size load banks are needed for electrical performance testing of ground power generators to ensure they can safely and efficiently supply power to aircraft in USAFE. Following an 8 month test with no failures, SA-ALC has assigned a stock number and will begin procurement in FY92. All Major Commands have identified a requirement for the suitcase size load banks. Return-on-Investment is estimated at an incredible 964.5:1.
   - (U) Completed the design and 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. Results in 32 more E-3A sorties per year and provides Tinker AFB with an intermediate-level capability for approximately 67% of the E-3A's electrical problems.

2. (U) FY 1992 Planned Program:
   - (U) Complete the manufacture and test of the E-3A Sixport Waveguide Switch. It was the highest failure item (failed five times) on the E-3A during Desert Storm. Reliability will increase an estimated 14 times with repair times reduced 10 fold.

Program Element: #0708026F
PE Title: Productivity, Reliability, Availabiltiy, Maintainability (PRAM)
Program Number: N/A
Budget Activity: #6-Defense Wide Mission Support

- (U) Complete qualification testing and begin flight test on the Solid State Barometric Altimeter. Current altimeters require "watchmaker" skills to repair due to their complex internal design. The new altimeter will be 20 times more reliable and require much less time and skill to repair due to its solid state design.
- (U) Continue the design effort towards a solid state F-15 Air Navigation Multiple Indicator (ANMI), using state-of-the-art Liquid Crystal Display technology. It will have 6 times the reliability and be easier to maintain.
- (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) Complete the redesign and test of a new shipping and storage container for the ALQ-155 Receiver/Transmitter (RT). The current wooden container requires extensive preparation, has a 10-shipment life, and cannot be shipped by LOGAIR if the RT unit is leaking. The Air Force Packaging and Evaluation Activity at WPAFB will design an aluminum container that has a 20-year life and removes all previous restrictions.

3. (U) FY 1993 Planned Program:
   - (U) Complete the development of a prototype forward looking infrared camera. The camera will be implemented on the B-52. The current B-52 camera requires extensive maintenance and has marginal performance. This project will produce 5 cameras to increase the combat capability and reliability, and decrease the system size. MTBF is expected to increase from 127 hours to 1000 hours.
   - (U) Continue FY 92 actions to qualify a new corrosion resistant, high temperature alloy. The alloy will be implemented on the F-15 C/D aircraft main wheel. The current main wheel requires frequent depot maintenance and is subject to corrosion. The new wheel will have 9 times the corrosion resistance and be twice as reliable as the current wheel. This wheel material also may be used on F15A/B, ATF aircraft, and other future aircraft.
   - (U) "Life of the Aircraft" brake housing to be implemented on the F-15. Project will test an aluminum-iron-vanadium-silicon alloy brake housing that is stiffer, has greater high temperature strength than the current 7049 alloy, will never require heat treating, and is expected to last the life of the aircraft.
   - (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.

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

Program Element: #0708026F
PE Title: Productivity, Reliability, Availabiltiy, Maintainability (PRAM)
Program Number: N/A
Budget Activity: #6-Defense Wide Mission Support

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; Lockheed Aircraft Systems, Marietta, GA; and SAIC, San Diego, CA.

E.(U) COMPARISON WITH FY 1992 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 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 1993 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 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 4139 Civilian Compensation Program | 4,478 | 5,174 | 5,300 | Cont | N/A |
| Total | 4,478 | 5,174 | 5,300 | 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 1991 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. 1991 R&D funding paid for injuries and illnesses incurred by R&D employees.

(U) FY 1992 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 1993 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 Budget Activity: #6 - Defense-Wide Mission Support
PE Title: Civilian Compensation Program

(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 1993 RDT&E DESCRIPTIVE SUMMARY

Program Element: #1001004F
PE Title: International Activities

Budget Activity: #6 - Defense-Wide Mission Support

A. (U) RESOURCES ($ in Thousands)

| Project Number & Title | FY 1991 Actual | FY 1992 Estimate | FY 1993 Estimate | To Complete | Total Program |
|---|---|---|---|---|---|
| 6600AH SHAPE Technical Centre, von Karman Institute, AGARD, ICRD&A Support | | | | | |
| Total | 3.288 | 2.946 | 3.727 | 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 FY 1993:

1. (U) Project #6600AH, Supreme Headquarters Allied Powers Europe (SHAPE) Technical Centre (STC)/ von Karman Institute (VKI)/ Advisory Group for Aerospace Research and Development (AGARD)/ International Cooperative Research Development and Acquisition (ICRD&A) Support: STC- Supports USAF participation in cooperative research and development agencies and groups. VKI- Fulfills US commitment (VKI Charter from 1956) to NATO for fair share allocation to VKI. AGARD- DoD Regulation 2010.1 designates AF as Executive Agent for managing and supporting AGARD activities. ICRD&A- Funds all aspects of seeking, negotiating, implementing and executing ICRD&A agreements.

(U) FY 1991 Accomplishments:

- (U) STC - Supported US interests through US R&D Coordinator who funds and monitors 15 scientists and engineers at STC.
- (U) VKI - Funded US share (12.8%) of the VKI international budget. Continued funding $30K in USAF-VKI fellowships. VKI annually graduates over 70 scientists, conducts 10 lecture series and publishes numerous technical reports.
- (U) AGARD - Financially supported the participation of up to 100 US experts in 9 technical panels, 21 working groups and 1 study committee.

Program Element: #1001004F Budget Activity: #6 - Defense-Wide Mission Support
PE Title: International Activities

- (U) ICRD&A - Funded all aspects of Air Force international cooperative research, development and acquisition (ICRD&A) to include setting up conferences, travel and per diem to attend meetings; contractor support; and support for our European liaison offices. Negotiated and concluded agreements with NATO and other major allies to assure AF access to overseas technology and to leverage AF R&D investments via cooperative programs. Supported major US presence at Paris Air Show. Continued support of OSD-led Systems and Technology Forum with Japan and increased cooperative efforts with NATO, Israel, Australia, Brazil and Sweden.

(U) FY 1992 Planned Program:
- (U) Continue Shape Technical Centre (STC) support.
- (U) Continue funding U.S. share of von Karman Institute (VKI) international budget.
- (U) Reduce funding for USAF-VKI fellowships.
- (U) Reduce support of NATO Advisory Group for Aerospace R&D (AGARD).
- (U) Reduce funding for ICRD&A efforts.

(U) FY 1993 Planned Program:
- (U) Continue STC support.
- (U) Continue funding U.S. share of VKI's international budget.
- (U) Increase funding for USAF-VKI fellowships to FY91 level and increase for inflation.
- (U) Increase (AGARD) support to FY91 level and increase for inflation.
- (U) Increase funding of ICRD&A efforts to FY91 level and increase for inflation.
- (U) Initiate funding for USAF presence at major international air shows.
- (U) Initiate collaborative projects under NATO 4-Power Air Senior National Representative Council, Japan Systems and Technology Forum, and Israeli Reciprocal Defense Procurement Agreement.

(U) Work Performed By: Leading US civilian and military scientists, engineers and administrators, and the TECHPLAN Corporation of Marlton, New Jersey. The Chief of the International Programs Division in the Office of the Assistant Secretary of the Air Force (Acquisition) administers the program.

(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) STC - Support based on STC Charter signed in 1963 by all NATO countries. VKI - NATO support funding agreements signed in 1959 commits US to share funding with 13 other NATO countries. AGARD - Support based on AGARD Charter signed in 1971 by all NATO countries. ICRD&A - Support based on numerous international agreements and programs.

MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT-OWNED FACILITIES FUNDED BY RDT&E

Department/Agency: Air Force

Part 1. Utilization of Section 2353, Title to 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 FY91 and planned in FY92 and FY93.

Section I. Projects Accomplished or Underway

| Facility/Equipment | Program Element | Contractor | Location | TOTAL OBLIGATION AUTHORITY (Thousands of Dollars) 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|
| Hazardous Processing Facility 1_/* | 33110F | Stearns-Rogers | Cape Canaveral AFS, FL | 9,000 | 1,800 | |
| Add/Alter Titan (IV) Facility 1_/* | 34111F | Martin Marietta | Vandenberg AFB, CA | 13,000 | | |
| Launch Complex 40 Mods 1_/* | 35119F | Martin Marietta | Cape Canaveral AFS, FL | 37,000 | 36,000 | |
| Contractor R&D SLC-3E Atlas II Conversion 1_/* | 34111F | General Dynamics | Vandenberg AFB, CA | | 35,000 | 120,000 |
| Upgrade Technical Support Bldg (TSB)-2, Bldg 732 1_/ | 34111F | Lockheed | Vandenberg AFB, CA | | 2,500 | |
| Contractor R&D - Space Test Support Facility 1_/ | 34111F | McDonnell Douglas | Cape Canaveral AFS, FL | 2,000 | | |
| Addition to Chemical Stock Facility 1_/ | 63250F | MIT Lincoln Lab | Hanscom AFB, MA Bldg 1302M | 439 | 55 | |
| | | Total Part 1, Section 1 | | 61,439 | 75,355 | 120,000 |

1 _/ Listed in previous RDT&E Congressional submittal

* Cost, Scope and/or Year Changes

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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 OBLIGATION AUTHORITY (Thousands of Dollars) 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|
| Addition to Electronic Research Laboratory 1_/* | 62702F | MIT Lincoln Lab | Hanscom AFB, MA Bldg 1302V | | | 3,472 |
| Addition to Electronic Research Laboratory 1_/* | 63250F | MIT Lincoln Lab | Hanscom AFB, MA Bldg 1302C | | | 1,041 |
| ADAL Titan IV Facilities 2_/ | 34111F | Brown & Root | Vandenberg AFB, CA | | 20,800 | 17,800 |
| Contractor R&D Payload Encapsulation Facility 2_/ | 34111F | General Dynamics | Vandenberg AFB, CA | | | 20,000 |
| Advanced ElectroOptical System (AEOS) 2_/ | 12424F | Rockwell Power System | Maui, HI | | | 22,100 |
| | | | | 61,439 | 75,355 | 120,000 |
| | | | | 0 | 20,800 | 64,413 |
| | | | | 61,439 | 96,155 | 184,413 |

1_/ Listed in previous RDT&E Congressional submittal
2_/ Initial Listing
* Cost, Scope and/or Year Change

UNCLASSIFIED
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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 of all such projects for the installation of equipment, where the cost of installation is $200,000 or more, accomplished in FY91 and planned in FY92 and FY93.

Section I - Projects Accomplished or Underway

| Facility/Equipment | RDT&E Program Element | Location | TOTAL OBLIGATION AUTHORITY (Thousands of Dollars) 1991 | 1992 | 1993 |
|---|---|---|---|---|---|
| Peacekeeper Rail Garrison Basing/PIMS 1_/ | 64312F | Various | 14,300 | 2,600 | |
| Small ICBM Program 1_/ | 64312F | Various | 200 | 100 | |
| Reentry Systems Launch Program 1_/ | 63311F | Vandenberg AFB, CA | 1,500 | 1,400 | 900 |
| ETF Plant Automation 1_/ | 11213F 65807F | AEDC, Arnold AFB, TN | 34 | 76 | 161 |
| Freejet Test Cell C2 1_/ | Various | AEDC, Arnold AFB, TN | 1,800 | | |
| Upgrade Ballistic Range Capability 1_/ | Various | AEDC, Arnold AFB, TN | | 2,100 | 1,470 |
| R-Cells Instrument and Control Equipment 1_/ | 65807F | AEDC, Arnold AFB, TN | 82 | | 244 |
| High Temperature Lab Equipment 1_/ | Various | AEDC, Arnold AFB, TN | 795 | 420 | |

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Part 2, Sect. I - Projects Accomplished or Underway (con't)

| Facility/Equipment | RDT&E Program Element | Location | TOTAL OBLIGATION AUTHORITY (Thousands of Dollars) 1991 | 1992 | 1993 |
|---|---|---|---|---|---|
| Foundry Processing Equipment 1_/ | 62102F | Wright-Patterson AFB, OH Bldg 20655 | 1,200 | | |
| Turbine Research Laboratory 1_/ | 62203F | Wright-Patterson AFB, OH Bldg 718, J-Bay | 495 | | |
| Test Unit Support System 1_/ | Various | AEDC, Arnold AFB, TN | 147 | 348 | 611 |
| | Total Part 2, Section I | | 20,553 | 7,044 | 3,386 |

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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 OBLIGATION AUTHORITY (Thousands of Dollars) 1991 | 1992 | 1993 |
|---|---|---|---|---|---|
| Equipment Installation Projects | | | | | |
| Aerodynamic & Propulsion Test Unit (APTU) Low Speed Modification 2_/ | Various | AEDC, Arnold AFB, TN | 220 | 361 | |
| Install Research Air System Test Cell 21 2_/ | 62203F | Wright-Patterson AFB, OH Bldg 18C | | 250 | |
| Install Anechoic Chamber 1_/* | 21002F | Wright-Patterson AFB, OH Bldg 4A | 1,400 | | |
| Install Combustion Air Heaters and Exhaust System 1_/* | 62203F | Wright-Patterson AFB, OH Bldg 490 | | | 750 |
| Install Chiller/Cooling Tower System 1_/* | 62203F | Wright-Patterson AFB, OH | | 650 | |
| Install Electronic Warfare Hot Bench Development System 1_/* | 62004F | 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 | 750 |
| Install Equipment for Electronic Warfare Countermeasure Fac 2_/ | 62204F | Wright-Patterson AFB, OH Bldg 620 | | | 700 |
| Upgrade HVAC Systems Test Cells 151 and 152 2_/ | 62203F | Wright-Patterson AFB, OH Bldg 490 | | 550 | |
| Install Metal Organic Molecular Beam Epitaxial System 1_/* | 62204F | Wright-Patterson AFB, OH Bldg 620 | | 495 | 500 |

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Part 2, Section II - Projects Planned or Projected (con't)

| Facility/Equipment | RDT&E Program Element | Location | TOTAL OBLIGATION AUTHORITY (Thousands of Dollars) 1991 | 1992 | 1993 |
|---|---|---|---|---|---|
| Installation of Pit for R&D Flight Simulators in Bldg 20145, Rm 210 1_/* | 63205F<br>63245F | Wright-Patterson AFB, OH<br>Area B, Bldg 20145 | | 160 | |
| Range 3 Modification and Replacement Equipment 1_/* | 64231F | Wright-Patterson AFB, OH<br>Bldg 20098 | | 700 | |
| Install Cray Computer System 1_/ | Various | Wright-Patterson AFB, OH<br>Bldg 676 | | 578 | |
| Freejet Test Cell C-1 2_/ | Various | AEDC, Arnold AFB, TN | | | 550 |
| Scientific/Engineering Computer Acquisition Project (SECAP) 1_/ | 65807F | AFFTC, Edwards AFB, CA | 222 | 222 | 366 |
| Computer Aided Engineering (CAE) System 1_/* | 65807F | AFFTC, Edwards AFB, CA | | 150 | |
| Avionics Lab, Bldg 1870 1_/ | CLASSIFIED | AFFTC, Edwards AFB, CA | | 500 | |
| Electric Propulsion Laboratory 2_/ | 62302F | Kirtland AFB, NM | | | 451 |
| National Hover Test Facility 2_/ | 62601F | Kirtland AFB, NM | | | 716 |

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Part 2, Section II - Projects Planned or Projected (con't)

| Test Facilities | RDT&E Program Element | Location | TOTAL OBLIGATION AUTHORITY (Thousands of Dollars) 1991 | 1992 | 1993 |
|---|---|---|---|---|---|
| None | | | | | |
| **Temporary Facilities** | | | | | |
| Cheyenne Mountain Upgrade (CMU) 1_/ | 12310F | Peterson AFB, CO | 328 | | |
| HAVE STARE Temporary Radar Support Structure 1_/* | 31315F | Vandenberg AFB, CA | | 1,848 | |
| | Total Part 2, Section I | | 20,553 | 7,044 | 3,386 |
| | Total Part 2, Section II | | 2,170 | 7,764 | 5,283 |
| | Total Part 2 | | 22,723 | 14,808 | 8,669 |

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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 $300,000 or less are funded from RDT&E appropriations for FY92 ($200,000 for FY91 and prior). 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 Major Command concerned, or delegated to R&D installation commanders as appropriate. The table below provides a summary of such minor construction accomplished in FY91 and estimated amounts planned for FY92 and FY93. 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. The amount for FY93 is for minor construction projects under $15,000.

| | TOTAL OBLIGATION AUTHORITY (Thousands of Dollars) | | |
|---|---|---|---|
| | 1991 | 1992 | 1993 |
| Summary of Minor Construction Funded by RDT&E, AF | 15,551 | 9,165 | 842 |

| Summary of Major Improvements to and Construction of Government-owned Facilities | | | |
|---|---|---|---|
| Subtotal Part 1 | 61,439 | 96,155 | 274,413 |
| Subtotal Part 2 | 22,723 | 14,808 | 8,669 |
| Subtotal Part 3 | 15,551 | 9,165 | 842 |
| Grand Total | 99,713 | 120,128 | 283,924 |

UNCLASSIFIED

| 1 COMPONENT | FY 1992-94 RDT&E FACILITIES PROJECT DATA | 2 DATE |
|---|---|---|
| AIR FORCE | | 1 AUG 91 |

| 3 INSTALLATION AND LOCATION | 4 PROJECT TITLE |
|---|---|
| VANDENBERG AFB CA | CONTRACTOR R&D --<br>ADAL TITAN FACILITIES |

| 5 PROGRAM ELEMENT | 6 CATEGORY CODE | 7 PROJECT NUMBER | 8 PROJECT COST ($000) |
|---|---|---|---|
| 34111F | 390-531 | | $51,800 |

9 COST ESTIMATES

| ITEM | U/M | QUANTITY | UNIT COST | COST ($000) |
|---|---|---|---|---|
| TITAN FACILITIES | LS | | | 51,800 |
| Cost of Purchased Equipment | | | | (TBD) |

10 DESCRIPTION OF PROPOSED CONSTRUCTION Alter existing facilities at SLC-4E and construct new facilities in support of expanded Titan program.

PROJECT: Modify and refurbish existing SLC-4 Facilities and construct new facilities on North and South VAFB to support final assembly, integration, and launch of the Titan Expendable Launch Vehicle (ELV).

REQUIREMENT: The Titan contractor is responsible to provide and launch Titan ELVs from Vandenberg AFB into polar orbit for critical DOD satellites. Existing facilities need to be modified to fit new launch vehicle configurations and to provide support for the various vehicle stages and payload processing facilities.

CURRENT SITUATION: There are four new Titan program users having multiple requirements that cannot be met by existing facilities. These users are larger and more complex with programs possessing much expanded launch processing requirements. The existing facilities are outdated and inadequately sized to support the new users.

IMPACT IF NOT PROVIDED: The contractor will be unable to meet the critical launch dates.

| 1 COMPONENT | FY 1993 RDT&E FACILITIES PROJECT DATA | 2 DATE |
|---|---|---|
| AIR FORCE | | |

| 3 INSTALLATION AND LOCATION | 4 PROJECT TITLE |
|---|---|
| VANDENBERG AFB, CA | CONTRACTOR R&D<br>PAYLOAD ENCAPSULATION FACILITY |

| 5 PROGRAM ELEMENT | 6 CATEGORY CODE | 7 PROJECT NUMBER | 8 PROJECT COST ($000) |
|---|---|---|---|
| 34111F | 312-477 | | 20.0 |

9 COST ESTIMATES

| ITEM | U/M | QUANTITY | UNIT COST | COST ($000) |
|---|---|---|---|---|
| Payload Encapsulation Facility | LS | | | 20,000.0 |
| Design Cost (Non-Add) | | | | ( 1,600.0) |
| Equipment from Other Appropriations (Non-Add) | | | | (15,000.0) |

10 Description of Proposed Installation

Provide payload processing and encapsulation capability for Atlas Centaur (Atlas II) launch program at the Western Test Range at Vandenberg AFB. Facility construction and communications and ground systems installation shall be accomplished.

Project: Provide Atlas II payload processing and payload encapsulation at Vandenberg AFB.

Requirement: Atlas II launch services at Vandenberg AFB are required to provide access to space for critical payloads. This facility is Government owned/Contractor operated and is required for contractor processing of the payloads and encapsulation prior to transporting to SLC-3.

Current Situation: A facility for Atlas II payload processing and encapsulation does not exist.

Impact If Not Provided: Off-pad payload processing and encapsulation will not occur. This will severely impact launch capability.

| 1. COMPONENT | FY 1991-92 RDT&E FACILITIES PROJECT DATA | 2 DATE |
|---|---|---|
| AIR FORCE | | 17 JUL 91 |

| 3. INSTALLATION AND LOCATION | 4. PROJECT TITLE : EQUIPMENT INSTALLATION |
|---|---|
| ARNOLD AFB, COFFEE COUNTY, TN 37389 | APTU LOW SPEED MODIFICATION |

| 5. PROGRAM ELEMENT | 6. CATEGORY CODE | 7. PROJECT NUMBER | 8. PROJECT COST ($000) |
|---|---|---|---|
| 65807F | 318-614 | ANZY910271 | $581 |

9 COST ESTIMATES

| ITEM | U/M | QUANTITY | UNIT COST | COST ($000) |
|---|---|---|---|---|
| EQUIPMENT INSTALLATION: | | | | 581 |
| Engine Support Systems | | | | (461) |
| Diffuser/Exhauster System | | | | (120) |
| COST OF PURCHASED EQUIPMENT (NON-ADD) | | | | (1030) |
| TOTAL EQUIPMENT INSTALLED & EQUIPMENT COST | | | | (1611) |
| OTHER NON-ADD COSTS: | | | | |
| Checkout | | | | (60) |
| Design (Non-Add) | | | | (140) |

10 DESCRIPTION OF PROPOSED CONSTRUCTION

PROJECT: Install and modify Aerodynamic and Propulsion Test Unit (APTU) systems as required to support NASP Phase 2D engine testing beginning in FY92. This includes installation of a data acquisition system on loan from AEDC's Engine Test Facility (ETF), installation of a gaseous hydrogen fuel system, modification of the APTU diffuser/ejector system, installation and reactivation of the original Vitiated Air Heaters, and modification of several other systems.

REQUIREMENT: Modification of the APTU facility is required to provide for testing of sub-scale NASP engine modules. A hydrogen fuel system is required, and modifications to the facility test cell and exhauster system are required to handle the large test article and mass flow rates. An updated acquisition system is required to meet the user needs for more data channels and high reliability.

CURRENT SITUATION: The APTU facility is not currently configured for VAH testing or for testing of large air-breathing engines. The facility data acquisition system is outdated, of poor reliability, and with insufficient data channels for complex engine tests. Other facility systems were designed for simpler, smaller tests. Most systems are outdated with repair parts impossible to acquire.

IMPACT IF NOT PROVIDED: Without the modifications and equipment specified, testing of the NASP engine modules will not be possible.

| 1. COMPONENT | FY 1992 RDT&E FACILITIES PROJECT DATA | 2. DATE |
|---|---|---|
| AF (AFSC) | | 18 Jul 91 |

| 3. INSTALLATION AND LOCATION | 4. PROJECT TITLE |
|---|---|
| WRIGHT-PATTERSON AFB OH (AFLC) | INSTALL RESEARCH AIR SYSTEM TEST CELL 21, BLDG 18C |

| 5. PROGRAM ELEMENT | 6. CATEGORY CODE | 7. PROJECT NUMBER | 8. PROJECT COST ($000) |
|---|---|---|---|
| 62203F | 310-612 | NOT ASSIGNED | (529) 250.0 |

9. COST ESTIMATES

| ITEM | UNIT | QUANTITY | UNIT COST | COST ($000) |
|---|---|---|---|---|
| 1. FUNDED COST | | | | |
| EQUIPMENT INSTALLATION | LS | 1 | | 250.0 |
| CONTINGENCY (10%) | | | | 25.0 |
| 2. UNFUNDED COST | | | | |
| DESIGN (10%) | | | | 27.5 |
| 3. TOTAL COST | | | | 302.5 |

10. DESCRIPTION OF PROPOSED CONSTRUCTION

EQUIPMENT INSTALLATION: Install hot and cold air supply piping, to include associated valves, expansion joints, pressure relief devices, flow measurement devices, instrumentation and controls.

PROJECT: Install a research air supply piping system to research cell to provide enhanced capability for turbine heat transfer research. Piping system is to deliver compressed air to the research cell at the rate of 30 pounds (mass) per second at 750 psig. Project includes the installation of heated air (to 1200 degrees, Fahrenheit) and cold air (100°F) supply piping. The air supply piping, from the existing Component Research Air Facility, is conditioned air to simulate altitude conditions (to 120,000 ft) for aero propulsion component research.

CURRENT SITUATION: The research capability in the Heat Transfer Research Laboratory is limited to low compressed air flow rates and pressures. Heated air cannot presently be supplied to this research cell. A greatly enhanced capability can be provided by installing a piping system which will connect this research cell to existing Component Research Air Facility compressors and air heater.

IMPACT IF NOT PROVIDED: If this project is not accomplished, the capabilities to study and analyze heat transfer phenomena in future aircraft turbines will be limited in the Heat Transfer Research Laboratory.

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U.S. GOVERNMENT PRINTING OFFICE: 1988-241-241/80125

| 1. COMPONENT (AFSC) (AF) | FY 19__ 93 RDT&E FACILITIES PROJECT DATA | 2. DATE 18 SEP 1991 |
|---|---|---|

| 3. INSTALLATION AND LOCATION | 4. PROJECT TITLE |
|---|---|
| WRIGHT-PATTERSON AFB, OHIO | INSTALL EQUIP FOR ELECTRONIC WARFARE COUNTERMEASURES |

| 5. PROGRAM ELEMENT | 6. CATEGORY CODE | 7. PROJECT NUMBER | 8. PROJECT COST ($000) |
|---|---|---|---|
| 62204F | 310-932 | EQ 93-2201 | 700.0 |

9. COST ESTIMATES

| ITEM | U/M | QUANTITY | UNIT COST | COST ($000) |
|---|---|---|---|---|
| INSTALL EQUIPMENT FOR ELECTRONIC WARFARE COUNTERMEASURES | | | | |
| RAISED FLOORING | LS | | | (100.0) |
| SECONDARY UTILITIES | LS | | | (200.0) |
| AIR CONDITIONING | LS | | | (400.0) |
| COST OF PURCHASED EQUIPMENT (NON-ADD) | | | | (1,010.0) |
| TOTAL EQUIP AND INSTALLATION COST (NON-ADD) | | | | (1,710.0) |
| OTHER NON-ADD COSTS (DESIGN) | | | | (70.0) |

10. DESCRIPTION OF PROPOSED Installation: Provide raised flooring, secondary utilities, and air conditioning.

PROJECT: Equipment installation for electronic warfare countermeasures.

REQUIREMENT: The installation of equipment is required to support an in-house R&D effort to effectively develop and evaluate advanced electronic jamming concepts, systems and supporting technologies. This R&D effort must be performed in a Top Secret (TS) sensitive-compartmented information (SCIF) laboratory environment to produce the results necessary for the development of advanced electronic warfare systems. This environment will consist of a totally modular shielded room to house the R&D equipment (RF Simulator). All of the secondary utility work and air conditioning is in direct support of the R&D equipment. Since all work is equipment related, no other associated work including minor construction and repair projects is anticipated.

CURRENT SITUATION: Because of the lack of adequate secure facilities, current in-house R&D efforts involving command, control and communication countermeasures are restricted to the SECRET level of classification. This limits the simulation and generation of electronic signals necessary in the laboratory for the research and development of modern more advanced electronic warfare systems.

IMPACT IF NOT PROVIDED: The capability to perform R&D countermeasures against threat signals will not be possible. Only generic unclassified signals, or those limited to the secret level, could be evaluated. This would be extremely costly to the Air force in terms of inappropriate or ineffectively deployed electronic warfare systems.

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| 1. COMPONENT: AF (AFSC) | FY 1992 RDT&E FACILITIES PROJECT DATA | 2. DATE: 18 Jul 91 |
|---|---|---|

| 3. INSTALLATION AND LOCATION | 4. PROJECT TITLE |
|---|---|
| WRIGHT-PATTERSON AFB OH (AFLC) | UPGRADE HVAC SYSTEM TEST CELLS 151/152, BLDG 490 |

| 5. PROGRAM ELEMENT | 6. CATEGORY CODE | 7. PROJECT NUMBER | 8. PROJECT COST ($000) |
|---|---|---|---|
| 62203F | 218-612 | NOT ASSIGNED | (529) 50.0<br>(592) 550.0 |

9. COST ESTIMATES

| ITEM | U/M | QUANTITY | UNIT COST | COST ($000) |
|---|---|---|---|---|
| 1. FUNDED COST | | | | |
| MINOR CONSTRUCTION | LS | 1 | | 50.0 |
| EQUIPMENT INSTALLATION | LS | 1 | | 550.0 |
| CONTINGENCY (10%) | | | | 60.0 |
| 2. UNFUNDED COST | | | | |
| DESIGN (10%) | | | | 66.0 |
| 3. TOTAL COST | | | | 726.0 |

10. DESCRIPTION OF PROPOSED CONSTRUCTION

MINOR CONSTRUCTION: Site work necessary to install heating, ventilating and air conditioning equipment and supporting utilities and perform related building modifications.
EQUIPMENT INSTALLATION: Install heating, ventilating and air conditioning units and mechanical equipment. Install associated ductwork, piping, electrical equipment and controls.
PROJECT: Install aforementioned equipment to provide a well-conditioned environment for sensitive research hardware and instrumentation. Project will support two high-bay combustion research test cells. This is for equipment space.
CURRENT SITUATION: The existing heating and ventilation system is unsuitable for combustion research, which involves optical diagnostic techniques. The optical equipment requires close temperature and humidity control. The lack of cooling in these research cells does not allow research to be conducted in summer months due to large temperature fluctuations and very humid conditions. The present heating system is marginal in winter months.
IMPACT IF NOT PROVIDED: The accuracy and repeatability of combustion experiments in these research cells will be jeopardized if this project is not accomplished. If this equipment is not installed, research will not be possible during extreme environmental conditions.

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| 1. COMPONENT | FY 19 93 MILITARY CONSTRUCTION PROJECT DATA | 2. DATE |
|---|---|---|
| Air Force | | 22 Jan 92 |

| 3. INSTALLATION AND LOCATION | 4. PROJECT TITLE |
|---|---|
| MAUI SATELLITE TRACKING STATION, HAWAII | ADVANCED ELECTRO-OPTICAL SYSTEM (AEOS) (CONTRACTOR R&D) |

| 5. PROGRAM ELEMENT | 6. CATEGORY CODE | 7. PROJECT NUMBER | 8. PROJECT COST ($000) |
|---|---|---|---|
| 1 24 24F | 312-477 | | 22,100 (RDT&E) |

9. COST ESTIMATES

| ITEM | U/M | QUANTITY | UNIT COST | COST ($000) |
|---|---|---|---|---|
| AEOS TELESCOPE FACILITY | SF | 40,000 | | 14,800 |
| SUPPORTING FACILITIES | | | | 5,000 |
| UTILITIES | LS | | | (2,500) |
| COMMUNICATIONS SUPPORT | LS | | | ( 750) |
| SITE IMPROVEMENTS | LS | | | ( 750) |
| FIRE PROTECTION SYSTEM | LS | | | (1,000) |
| SUBTOTAL | | | | 19,800 |
| CONTINGENCY (5%) | | | | 990 |
| TOTAL CONTRACT COST | | | | 20,790 |
| SUPERVISION, INSPECTION & OVERHEAD (6%) | | | | 1,247 |
| TOTAL REQUEST | | | | 22,037 |
| TOTAL REQUEST (ROUNDED) | | | | 22,100 |
| EQUIPMENT FROM OTHER APPROPIATION (RDT&E) | | | | |
| FY 92 - 4.0 METER TELESCOPE | | | | (19,300) |
| FY 93 - ADAPTIVE OPTICS | | | | (15,000) |

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Construct a 40,000 SF facility to include isolation foundation floor slab, concrete walls and roof, specialized HVAC system using an ice plant system, electrical distribution to the site, upgrade the electrical substation, and fire protection.

11. REQUIREMENT: 1 EA ADEQUATE: 0 SUBSTANDARD: 0

PROJECT: Construct a 40,000 SF facility to house a 4.0 meter telescope, its mount, gimbal and dome.

REQUIREMENT: The Advanced Electro-Optical System (AEOS) and its new 4.0 meter telescope is required to continue the research and development efforts for the Space Object Identification (SOI) program. The SOI R&D program is part of the SPACETRACK program element and is critical in supporting USPACECOM missions. This R&D program is required to improve object identification in space by utilizing state-of-the-art mirror technology and sensors. The AEOS facility will allow SOI research in atmospheric compensation, tracking and imaging to be accomplished at the Maui Satellite Tracking Site (MSTS). The location itself is required because of geographical (the latitude and longitude is important in observing tracks by space objects) and environmental (thermal air currents) considerations.

CURRENT SITUATION: The existing Air Force Maui Optical Site (AMOS) has a 1.2 and a 1.6 meter telescope which do not have the large aperture of a 4.0 meter telescope mirror. The AMOS facility and equipment was installed in the 1960s. Current mirror technology has long surpassed the capabilities of AMOS. With the larger mirrors and its associated sensors and computers, the AEOS can dramatically improve object imaging at greater distance and through a variety of atmospheric conditions.

| 1. COMPONENT | FY 1993 MILITARY CONSTRUCTION PROJECT DATA | 2. DATE |
|---|---|---|
| Air Force | | 22 Jan 92 |

3. INSTALLATION AND LOCATION

MAUI SATELLITE TRACKING STATION, HAWAII

| 4. PROJECT TITLE | 5. PROJECT NUMBER |
|---|---|
| ADVANCED ELECTRO-OPTICAL SYSTEM (AEOS) | |

IMPACT IF NOT PROVIDED: The United States and the Air Force will not only fail to make advances in optics research, but also fall behind other countries now developing this technology.

CONTRACT NUMBER: F05603-90-C-0010

SCHEDULED INSTALLATION DATE: FY 93

RATIONALE FOR FUNDING EFFORT IN RDT&E (3600) PROGRAM VERSUS MILITARY CONSTRUCTION (3300) PROGRAM: AFR 80-22 (Draft), 6 Aug 91, paragraph 2c(1), states government owned, contractor operated facilities may use RDT&E funds for "a specialized structure constructed solely for use in a specific R&D project." The AEOS is a R&D facility to be used by Rockwell Power Systems, a contractor, conducting research in support of the SOI program.

| 1. COMPONENT | FY 19__ MILITARY CONSTRUCTION PROJECT DATA | 2. DATE |
|---|---|---|
| AIR FORCE | | 23 JAN 92 |

| 3. INSTALLATION AND LOCATION | 4. PROJECT TITLE |
|---|---|
| KIRTLAND AFB, NM | NATIONAL HOVER TEST FACILITY |

| 5. PROGRAM ELEMENT | 6. CATEGORY CODE | 7. PROJECT NUMBER | 8. PROJECT COST ($000) |
|---|---|---|---|
| 62601F | | | 716 |

9. COST ESTIMATES

| ITEM | U/M | QUANTITY | UNIT COST | COST ($000) |
|---|---|---|---|---|
| EQUIPMENT INSTALLATION | LS | | | 716 |

10. DESCRIPTION OF PROPOSED CONSTRUCTION Modify existing building to accommodate installation of equipment.

PROJECT: Relocate National Hover Test Facility from Edwards AFB, CA to Philips Laboratory at Kirtland AFB, NM. Work includes installation of equipment such as fragmentation net, viewing port, communications and video network, laser ranging system, emergency range shut down systems, nitrogen purge systems, and building modifications to support functionality of the equipment.

REQUIREMENT: The Hover Test Facility is required for the Lightweight Exo-Atmospheric Projectile (LEAP) program. This program is an integrated space projectile technology development and demonstration effort in support of the SDIO ballistic missile defense mission. The LEAP program is designed to develop and integrate cutting edge Kinetic Energy Weapons projectile technologies for performing exo-atmospheric ballistic missile defense and demonstrate performance of the integrated vehicle through ground and flight testing.

CURRENT SITUATION: The existing National Hover Test Facility is located in California. Relocating to Phillips Lab at Kirtland AFB will enable technology and information to be shared to improve the research effort.

IMPACT IF NOT PROVIDED: The National Hover Test Facility being physically separated from the Phillips Laboratory at Kirtland AFB will hamper technology integration and coordination..